MANUAL OF MEDICAL GYMNASTICS

BY

THE BARON NILS POSSE, K.G.V.

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GYMNASIUM, BOSTON, TILL HIS DEATH,
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MEDICAL GYMNASTICS

PREFACE.

WHILE no one can learn to apply Medical Gymnastics by mere book study, yet the acquiring of practical skill will be materially aided if the masseur has a good reference book.

The author has attempted to give the scientific reasons for the *esse* of the different procedures, and has avoided as far as possible dealing with generalities. A masseur is not helped by being told that a certain movement "affects the chest" or "stimulates the liver;" he must know how the chest is affected, how the liver is stimulated. Otherwise he will be successful only so far as he is a good guesser.

Manual proficiency is not the only requisite of a skilled masseur, but equally important is a knowledge of anatomy, physiology, and pathology, and it is to be hoped that the time will come when this country will adopt a strictly enforced medical legislation which will reach the practitioners of massage, who would then be licensed only after giving satisfactory proof of their professional education. Medical gymnastics, Swedish Movement Cure, Mechano-Therapy, or briefly Massage, is manifestly of too great a value as a therapeutic agent to be ignored. It is nature's own remedy being practically applied Physiology.

BARON NILS POSSE.

PREFACE BY THE EDITOR.

THE first 159 pages of this book were published in the form of advance sheets by the author, Baron Nils Posse. The remainder has been compiled from notes, lectures, and manuscript which were found among the papers of the late baron, after his death.

It had been his intention to make this treatise much larger and more comprehensive than the present volume, but the editor has endeavored to present the essential features of the work in a concise form, and therein has been ably assisted by several of Baron Posse's former pupils.

BARONESS ROSE POSSE.

MEDICAL GYMNASTICS

PART 1.

MATERIA GYMNASTICA.

Definition. — *Medical Gymnastics* means systematic exercise of the muscles and other tissues for therapeutic purposes While no distinct line can be drawn between Hygienic and Medical gymnastics, it will however be found that a majority of the medico-gymnastic procedures differ from ordinary gymnastics even though these are used as auxiliaries in special cases. In these chapters but few movements of the last-named kind will be described, as a masseur of to-day is expected to be well versed in the theory of educational gymnastics before he attempts the medical branch of the science.

Medical Gymnastics has been commonly known as "Swedish Movement Cure," "Movement treatment," etc., and whereas some authors cannot lay enough stress on the distinction between medical gymnastics and massage, others have included under the last name all forms of manual therapeutics. Massage, however, is usually understood as denoting one of the procedures of friction, kneading, pressure and percussion, each one of which may be regarded as passive exercise of the muscles. It will then be the most convenient to include massage in

the name "medical gymnastics," all the more since a skilled masseur never relies exclusively on massage proper, nor a medical gymnast on "Swedish movements."

Since times immemorial exercise of one kind or another has been used for curative purposes; yet we owe it to the Swede Pehr Henrik Ling and to his pupils and followers that science was brought to bear on the subject; and while scientific therapo-gymnastics may have been said to originate in Sweden, medical gymnastics to-day has ceased to be merely a "Swedish Movement Cure."

While Dr. Metzger of Amsterdam has revived the interest in massage in continental Europe, neither he nor Ling invented this form of treatment. Dr. Metzger* applies what Ling** described before Metzger was born; and Ling gathered his information from still remoter sources, not least from Chinese manuscripts handed down to the present generation since 3000 years B. C.

Among the Hindoos, massage was called "champna," which means to rub or scrub. Through the Middle Ages, massage was followed by the monks in the monasteries, and by priests, who had the reputation of healing diseases by the laying on of hands. Ling became interested in this method of healing as a result of having rheumatism in his shoulder. He began fencing and his ailment grew better. He continued to fence and in a short time the rheumatism had disappeared. Although he was not a physician, Ling had a knowledge of anatomy and

* Born 1840. ** Died 1839.

physiology, and he at once started his investigations which were to be of such benefit to mankind.

Before entering into the consideration of details, it may be well to state a few facts pertaining to movements in general.

Position and Movement.—A movement is a change from one position to another, and might be said to consist of a sequence of positions. In order to accomplish a definite, preconceived purpose, commencing position, final position, sphere of action, velocity, force, duration, etc., must be exact.

Effects of Movements.—"The effect of a movement is the result of its action, and the reaction of our organism" (Roth). The effect may be physical, physiological and psychological, and movements also have both a general and a local effect. While the local effect usually decides the choice of a movement, its general effects should never be left entirely out of consideration. Also medical gymnastics may be applied as local or as constitutional treatment in accordance with these effects.

The general effects of active movements are those of ordinary gymnastics, *i. e.*, a general increase of the functional activity; resistive movements emphasize these effects, while assistive movements produce them in a less degree. Active movements involve the use of attention, and consequently cultivate voluntary control, while passive movements diminish motor irritability and voluntary

co-ordination, and favor inattention or inactivity of attention. Active movements diminish sensory, and heighten motor irritability, harden the fibrous tissues,and lessen the adipose ones; passive movements may increase sensory and lessen motor irritability, make lamellous texture predominant and cause a greater amount of fat to accumulate between the muscles and under the skin.

The local effects of movements will be described with each procedure.

Positions.—Although massage proper is usually applied while the operator is reclining or lying down, for other procedures commencing positions of the most diverse kinds are used for exactness of effect—for its localization or generalization. Commencing positions are elementary and derived. Elementary are lying, sitting, kneeling, standing and hanging; all others are derived from these.

Classification of Movements.—Medico-gymnastic movements are *active* when executed by the patient himself; if the operator makes resistance against the movement it becomes *resistive*; if he helps the patient in performing it, it becomes *assistive*; if he is doing the movement without any voluntary effort whatsoever from the patient, the movement is called *passive*, while the movement executed by the patient without aid or resistance from the operator is called *single*. Besides these general names, each procedure has one denoting its mechanics, so that a synopsis of the subject would present the following appearance: —

- Medical Gymnastics.
  - Massage
    - Friction
    - Kneading
    - Pressure
    - Percussion
    - Vibration
  - "Swedish Movements."
    - Circumduction
    - Rotation
    - Flexion
    - Extension
    - Elevation
    - Depression
    - Abduction
    - Adduction
    - etc.

  (Passive / Active)

While this classification will be of assistance in describing the movements, yet for therapeutic purposes a classification according to effects will be more rational and after the masseur has acquired the mechanics of the various procedures, he will be best helped by memorizing the following synopsis:

- Medical Gymnastics.
  - Passive
    - Friction, Kneading, Circumduction, etc. — Mov'ts. of resorption.
    - Pressure, Percussion, Vibration — Mov'ts. of neurition.

    (Efflux — Relaxation.)
  - Active
    - Assistive, Single, Resistive — Mov'ts of nutrition.

    (Afflux — Attention.)

The rationale of this will be plain after the various movements have been described.

1

Lying pos. (fig. 1) — The patient is lying on his back, his arms along his sides; knees straight; heels together; and the body supported along its entire length. Characteristics of this position are the total relaxation of all voluntary muscles and the consequent diminution of cerebration. As compared to the standing pos., respiration is now more labored; for the inspiratory muscles especially the diaphragm, are directly opposing gravity in their effect upon the abdominal organs: the sagittal expansion of the abdomen diminishes while the lateral one increases. Viscera gravitate toward the posterior side of the body, and the total circulation increases in this direction, even to causing spinal congestion.

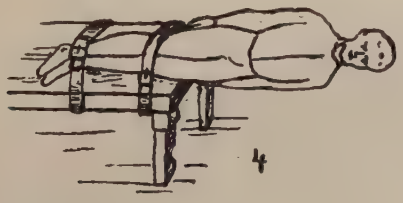
2

Sit-lying (Fig.2) — Lying with the legs hanging unsupported. Fascia Lata has now become somewhat tense, and the inferior attachments of the abdominal muscles

are slightly drawn down. The inspiratory condensation wave in the abdomen becomes shallower; and the pelvic contents are pressed toward the sacrum.

3

Leg-lying (Fig.3) — The body is supported only from feet to waist. The muscles of the abdomen and thigh are now tense; viscera are forced backward; and the blood is driven into chest and head, especially toward the medulla. At first there is an increase of attention which is soon followed by dizziness.



4

Side-lying. — The body is resting on the side.

Side-leg-lying. (Fig.4)— A combination of the last two. Here gravity assisted by the carrying muscles causes the spine to curve to the under side, which becomes expanded.

5

Prone-lying, (Fig.5) — The body is lying face down. It is usually taken so that the plantar side of the toes braces the body behind; and the elbows, vertically under the shoulders, with hands grasping opposite arms, support the body in front. In this situation, viscera gravitate forward; the chest is expanded; and internal elevation results. Gravity draws the blood into the anterior portion of the body, away from the spine and cerebellum. The position is one of "meditation."

6

Forward lying(Fig.6)—The body, turned face down, is supported from the waist down. The glutei and extensors of the back are in contraction; the dorsal spine straightens and the chest becomes vaulted. The position heightens respiration and cerebration. The farther the support

is from the head, the lower in the back will be found the strongest muscular contraction; so that, if the upper dorsal region is to be affected, the support is placed under the thorax.

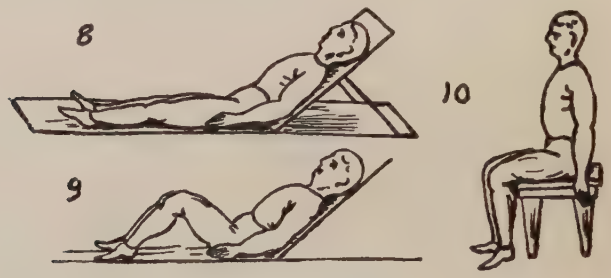
7

Crook-lying — (Fig. 7) — The knees are drawn up and feet supported (vertically under the knees). The muscles of the abdomen are now relaxed and viscera fall backward-upward. The tension in the lumbar fascia through the glutei causes the lumbar curvature to straighten. The position favors thoracic aspiration.

Reclining (*fig.* 8)—The body is resting on a couch so that the trunk is inclined backward. Respiration is easier than in ly. pos. This position is specially suited for massage or other movements where a saving of energy is desired. The more the body inclines, the less is the relaxation of the abdomen. The posture is one of ease and comfort, although less passive than the ly. pos.

Crook reclining (*fig.* 9)—Reclining with knees drawn up as in cr. ly. The abdomen is completely relaxed; viscera spread laterally and fall toward the sacrum. The

blood also gravitates toward this region. The position is especially suitable for massage of the abdomen and for active movements of other parts where the abdomen is to be excluded from the effect.



Sitting position (*fig* 10)—Ordinary sitting posture with erect trunk and head, hips and knees flexed at right angles, heels together and toes turned out, hands resting on the knees. Viscera become slightly compressed.

The posture is one of physical rest with mental activity, and produces isolation of the trunk from the legs. The short line of gravity makes this position less tiresome than standing.

Stoop sitt. (*fig.* 11)—Sitting, with the trunk inclined forward. The abdomen is now completely relaxed, and viscera compressed forw., while the back muscles are in contraction vaulting the chest. In this position attention is more active than in the previous one.

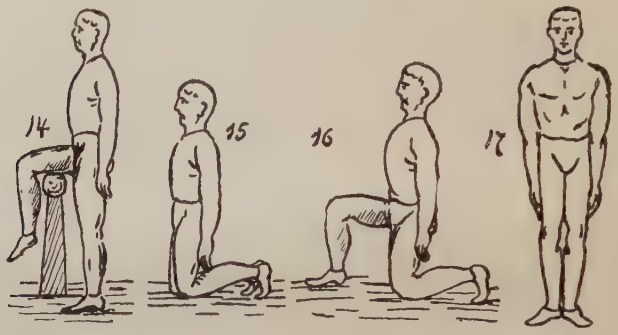
Fall sitt. (*fig.* 12)—Sitting with the trunk inclined backward. The feet should be inserted in some firm support, or an assistant gives support on the knees. The muscles of the abdomen are in contraction compressing viscera from above downward, driving the blood into the pelvis, and into the chest. The lumbar spine straightens.

Turn sitt.—Sitting with the body rotated to one side. This produces a unilateral expansion of the chest, and an oblique compression of the abdomen. The elongation of the thorax occurs towards the everted shoulder, and there is an elevation of viscera in this direction. The position is used chiefly in the treatment of scoliosis.

Long sitting (*fig.* 13)—Sitting with the legs put up. The relaxation of the fascia lata causes the lower insertions of the abdominal muscles to rise, with a consequent relaxation of the abdomen. The tension in the glutei is communicated into the hamstrings, so that the whole posterior leg is in passive extension. This determines a greater flow of blood through the legs, with a greater diminution of the supply to the spine. Mental activity is less than in sitt. pos.

Ride sitting—Sitting astride a chair, usually with the feet fixed. This produces absolute isolation of the hip joint so that trunk movements will be confined to the spine.

Half sitting (*fig.* 14)—Standing with one thigh resting over a support, the leg of that side hanging.—Is to be considered as a unilateral standing pos.



Kneeling, or knee-standing (*fig.* 15)—Standing on the knees; body erect; knees one foot length apart; heels together; toes turned out and resting with the plantar surface on the ground. The pelvis is compressed through the tension in fascia lata. The hip is fixed laterally through the tensor vaginæ femoris, and movements of the trunk are communicated into the pelvis instead of into the thigh, as in st. pos. The position is suitable in movements for pelvic disorders, but is fatiguing if long continued.

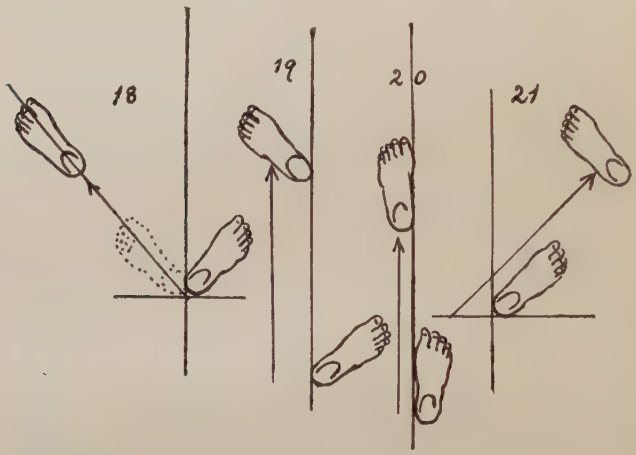
Half knee-standing (*fig.* 16)—1-2 kn. st.—Kneeling on one knee, the other foot on the floor in front, with the knee of that side bent so that the leg is vertical; the body erect from the backward knee. The tension in the muscles of the kneeling side causes fixation of linea alba, so that sagittal movements will be executed chiefly with the muscles of the opposite side, while the effect of internal elevation will be the strongest on the first named side. The position is suitable for unilateral effects upon the pelvis and groin.

Standing (*fig.* 17)—St.—Feet at right angles; heels together; knees straight; hips drawn backward; chest well elevated and brought forward; head high with chin drawn in; arms hanging along the sides. This position, characteristic of man, is expressive of concentrated energy, and is fundamental to all human locomotion. Yet, on account of the lack of isolation in this position, and because of its being tiresome, it is used but little in medical gymnastics, except for "single" movements. In this position respiration occurs more easily than in any other.

Close st.—The feet are turned straight forward. Equilibrium is less stable, and the abdomen is more relaxed than in st. pos.

Toe st.—The heels are raised from the ground. The dorsal spine is straighter, the chest more expanded and the abdomen more flattened than in st. pos.

Walk st.—One foot in advance of the other; the distance between the heels, two foot lengths; both knees straight; weight equally on both feet.

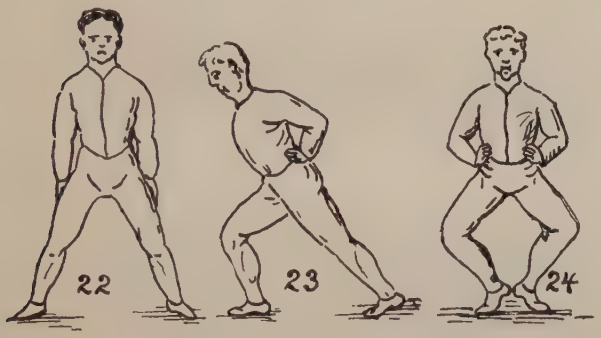


Wlk. *a* st. —fig. 18; wlk *b* st.—fig. 19; wlk. *c* st.—fig. 20; wlk. *d* st.—fig. 21.

Stride st.—(fig. 22)—Feet twice their own length apart; a line through the heels parallel with one through the shoulders. Both knees straight and weight equally on both feet. In this position equilibrium is better laterally, poorer sagittally, than in st. pos., through the corresponding fixation and relaxation of the hip joint.

The wlk. st. positions are used for muscular isolation, so that for instance trunk rotations are made more diffi-

cult and localized higher in the thorax by progressing from stride st. to wlk. *a*, wlk. *b*, wlk. *c*, and wlk *d*, st. pos., in the order enumerated, the rotations of the thigh becoming excluded from the movement. In wlk. *b* pos. backward movements produce a stronger tension in the posterior leg, and forward movements in the anterior one. The hip of the advanced leg is raised and the pelvis rotates to the opposite side. Whenever unilateral effects are desired, as in scoliosis, these positions are very useful.



Fallout st.—(fig. 23)—One foot three times its own length in advance of the other; feet turned out and fully on the ground; forward knee bent; backward knee straight, and this leg in a line with the body which inclines forward. The erectors of the spine are in stronger contraction than in st. pos., especially those of the side

corresponding to the backward leg. There is a diminution of capacity in the side of the thorax which corresponds to the advanced leg, the hip of this side rising, and there is an increase of capacity on the opposite side accompanied by a flattening of the abdomen. The blood is drawn from abdomen and pelvis into chest and legs. The position is very tiresome.

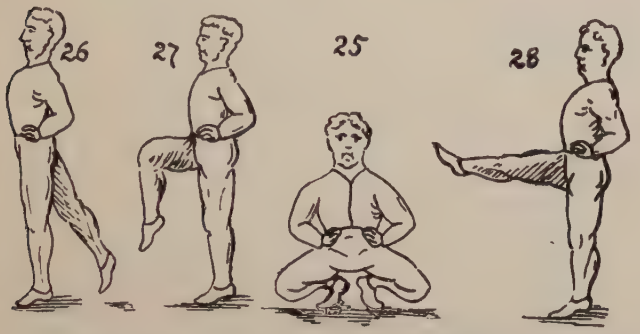
If the backward foot is inserted into some firm apparatus, the position is called foot grasp falloutst., which possesses all the qualities of the preceding one in exaggeration.

Courtesy st. (fig. 24)—From toe st. the knees are bent to right angles. The knees are turned out in direction of the feet; the heels are held together. The activity of the muscles of the legs determines a greater afflux in this direction. The chest is expanded more than in st. pos., and the abdomen compressed. The total result is a diminution of blood supply in the abdomen and pelvis. Internal organs of these cavities are forced backward. The position demands a great deal of co-ordination, and hence intensifies cerebellar activity and voluntary attention.

This position is also taken from stride st. pos. and from wlk. *b* st.

Courtesy sitting (fig. 25)—The knees are bent as far as possible. The effects are similar to those of the preced-

ing position, although highly increased. The effect upon the brain is diminished, as this position requires less effort of equilibrium.

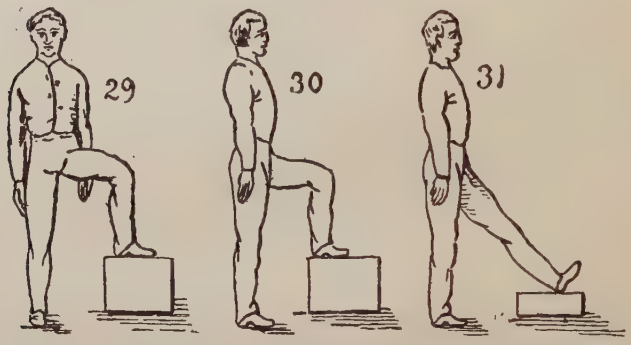


Half standing—1-2 st. (fig. 26)—Standing on one foot, the other raised backward. The contraction of the extensors of the back are strongest on the side of the lifted leg, so that the spine curves to the opposite side. The chest is the most expanded on the side of the carrying leg, and the trunk is slightly rotated to that side. Unilateral cerebration.

Crook a 1-2 *st.* (*Cr. a* 1-2 *st.*) (fig. 27)—Standing on one foot, the other leg lifted forward with hip and knee bent at right angles. Effects like preceding, added to which pelvic viscera on the side of the lifted leg become compressed from behind forward.

Cr. b 1-2 *st.* (fig. 28)—Standing on one foot, the other leg lifted forward with straight knee. Effects similar to

the preceding, but the anterior wall of the abdomen is also brought into contraction, producing internal elevation of pelvic viscera of that side. The posterior leg is in passive extension and consequently the quantity of blood in that leg increases.



Step. st. (fig. 30).—Standing on one foot, the other placed forward on a chair or other support, knee and hips at right angles.—The hip of the advanced foot is raised without disturbance of the dorsal spine, and the abdomen is relaxed on that side.

Side step st. (fig. 29).=preceding, but the foot is placed sideways instead of forward.—The principal change of effect is in the abdomen, which here is tense toward the lifted leg.

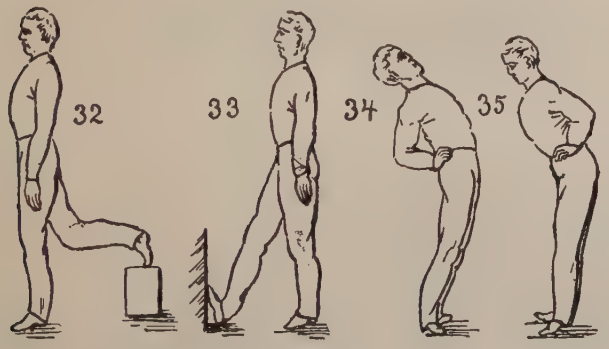
Heel grasp 1-2 *st.* (fig. 31).—One foot is placed forward with the heel resting on some support; knee

straight.—The passive extension of the hamstrings of the lifted leg causes a greater quantity of blood to flow into that leg, lessening the supply to the lumbar spine.

Instep gr. 1-2 *st.* (fig. 32)—One foot is placed backward upon some support, the knee flexed.—The passive extension of the anterior thigh draws the blood from the abdomen.

Brace st. (fig. 33.)—One foot is braced forward against the wall.—Produces passive extension of the forward calf.

Besides the above positions the trunk may assume any of the following:



Arch pos. (fig. 34.)—Body arched backward from sacrum to head.—The intervertebral substances are compressed behind, distended in front. The chest is arched forward, the inferior ribs drawn apart, abdomen flattened

and viscera drawn upward. Inhalation increases and mental activity decreases.

Fall pos. (fig 12.)—Body inclined backward without being arched.—There is no change in the chest worth mentioning, but the muscles of the abdomen are in strong contraction, driving viscera upward and diminishing the quantity of blood in the abdomen. The sagittal curve of the lumbar spine straightens.

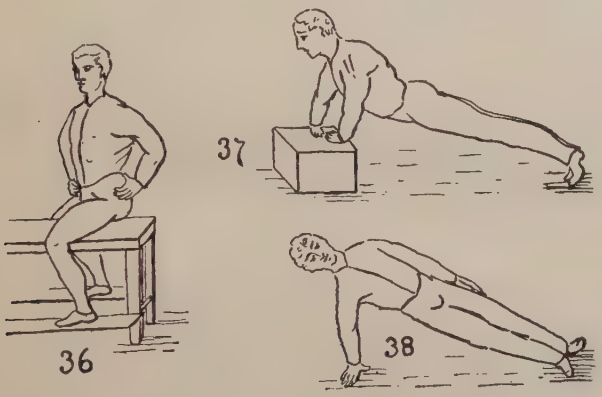
Stoop pos. (fig. 35.)—The body inclines forward with arched spine; chest well expanded.—The abdomen is compressed from above downward forward; the extensors of the spine are in strong contraction, (less so than in forw. ly. and falloutst. pos.) drawing the shoulder blades backward, downward. Respiration and mental activity are increased. The posterior leg-muscles are contracting excentrically, (compare "active movements" below) causing a greater afflux to this region.

Lax. pos.—The body is bent forward and completely relaxed.—Respiration diminishes, the chest being compressed. The abdomen is completely relaxed, with contents falling forward, downward. The blood gravitates from the thorax into the head and abdomen.

Turn pos. (fig. 36.)—The body is rotated to one side —The oblique muscles of the abdomen contracting, viscera become lifted toward the chest, the latter having expanded toward the side to which rotation occurred.

The spinal vessels become stretched, the afflux increasing, and the spine shows a tendency to convexity toward the side to which the vertebræ have been turned. Respiration is greater in the lung of that side than in the other one.

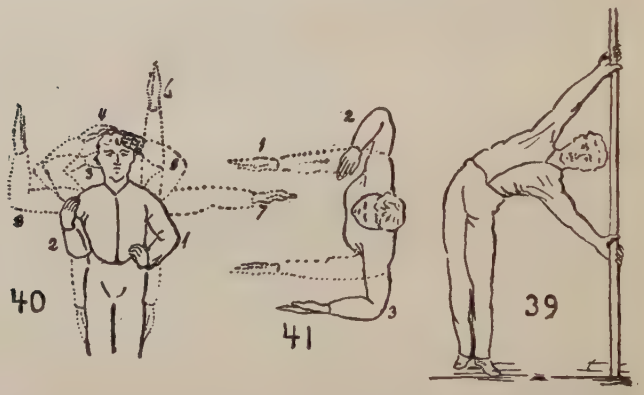
If one foot is in advance of the other and the body is rotated toward the backward foot, the position is called reverse turn (rev. turn).



Stoop falling pos. (fig. 37.)—Hands and feet on the floor, the body from head to heels forming a straight line. The hands are turned obliquely inward, and the toes are braced against the floor. This position has the same effects as prone ly. pos., (fig. 5), but requires more muscular strength for execution. The chest widens be-

tween the shoulders, and the effect of internal elevation is emphasized. The higher the hands are placed above the floor, the greater the effect upon the chest, the less on the abdomen.

Side falling pos. (fig. 38.)—One hand and one foot on the floor, the body in a straight line from head to heels. —The waist muscles of the under side are in strong contraction; the level of the hips deviates to the opposite side. Internal organs gravitate to the under side.



Side grasp, etc. (fig. 39.)—The arms are extended upward, the body bent to the side and the hands grasping a firm support.—The hip-level deviates to the upper side; the lumbar spine is arched to that side and the thorax is forcibly expanded with the upper side in passive extension.

Finally the arms can assume the following positions:

Wing pos.—(wg., fig. 40. 1.)—Hands grasp the waist in the middle, fingers in front, thumbs behind, palms resting on the hips. The elbows are drawn slightly backward.—The hips carry the shoulders through the oblique beams formed by the arms. The inspiratory muscles are given one more fixed insertion (on the arm), the chest is raised and respiration deeper. In movements of the trunk the body below the waist is more easily isolated, and in movements of the legs the trunk can be kept steadier.

Bend pos. (fig. 40. 2.)—The elbows are bent as far as possible; wrists and fingers bent; hands in front of the shoulders; arms vertical; elbows close to the waist.—The extensors of the elbow are in passive extension. There is a slight transverse tension in the clavicular region.

Rest pos. (fig. 40. 3.)—Hands locked behind the neck; elbows drawn well back; head high.—The whole chest is elevated, the pectoral portion fixed. The dorsal spine is straightened, and the shoulder-blades flattened on the back and rotated outward. The relation of the axillary artery favors the afflux to the arm with consequent diminution of supply to the head. The centre of gravity of the body is raised.

Shelter pos. (fig. 40. 4.)—The hands are locked on the top of the head.—The pectoral region is less tense than

in rest pos. The position is used to one side in scoliosis to draw the head to that side.

Think pos. (fig. 40. 5.)—The hands resting on the forehead, elbows back.—Is used only in sitt. res. exc. T. forward flex., to prevent the chest from contracting.

Reach pos. (fig. 41. 1.)—Arms lifted forward to horizontal, palms turned toward each other.

Stretch pos. (Str., fig. 40. 6.)—Arms extended upward to vertical; hands shoulder width apart, and palms turned toward each other.—The chest widens laterally and rises vertically with a slight transverse compression of the clavicular region. The abdomen flattens through passive extension of its muscles. The back widens, the shoulder-blades become fixed and the dorsal spine straightens. The total capacity of the chest has increased, but the tidal volume of air diminishes. The position is one of strong internal elevation with increased afflux in thorax and arms.

Hanging pos. (Hang.)=Str. pos., but the body is suspended from the hands grasping a firm support. All the muscles, with exception of those of the forearm, are in passive extension. The effect of internal elevation is emphasized: the chest is forcibly expanded in all directions, and the abdomen extremely tense. The weight of the legs acting through the sacrum stretches the spine, drawing its segments apart, and accelerating the return

current from the cord. (The old-time theory that the weight of the legs dragging the abdomen down should cause downward displacement of pelvic viscera is fallacious; for the abdomen does not carry the legs, and the tension in the abdomen is upward, toward the expanded chest.) The position is one of labored respiration, but tends to remove nervous fatigue.

When the palms face the body, the position is called under grasp hang., when the opposite way, over grasp hang.; and when the palms face each other, it is called double gr. hang.

In und. gr. the pectoral tendon is rolled up over the humerus, and the tension in the muscles is greater than in ov. gr. If one hand takes und. grasp the body rotates to the opposite side. In ov. gr. the expansion of the chest is chiefly transverse; in und. gr. it is sagittal.

By combination with preceding positions we get cr. hang., bend hang., arch hang., etc.

Yard pos.—The arms are lifted sideways to horizontal. According to the position of the forearms we have

Yd. a pos. (fig. 41. 2.)—Elbows drawn well back and flexed as far as possible; palms turned down; forearms and hands in a straight line.—Effect: tension in clavicular and pectoral chest, with increased apicial respiration; straightening of dorsal spine through contraction of rhomboidei and trapezii; shoulder-blades drawn toward the spine.

Yd. b pos. (fig. 41. 3.)—Elbows flexed at right angles; palms turned edgewise, radial border upward.

Yd. c pos. (fig. 40. 7.)—Elbows extended; arms and forearms in a line; palms turned down.—Effect: lateral expansion of the chest; straightening of axillary arteries, with consequent increase of afflux to the arms.

Yd. d pos.—*Yd. c* with palms turned up.—The outward rotation of the humerus increases the tension in the pectoralis major; consequently, as compared to the preceding position, the chest has been vaulted forward. The fixation of the shoulder-blades has also increased.

Yd. e pos. (fig. 40. 8.)—The forearms are vertical, palms turned toward each other.—The shoulder-blades have been drawn farther down, and the pectoralis minor brought into extension (the coracoid process being drawn backward); the expansion of the pectoral chest (with elevation of the sternum) is very great.

When only one side is to take the position, the figure 1-2 precedes the name, for instance: 1-2 str. wg. wlk. *b* st.; 1-2 Yd. *c* sitt.; 1-2 str., reach gr., stoop st., etc.

Movements.—Before entering into details, it might be well to state that when applying massage or Swedish movements the operator should place himself in such a position that he can accomplish the most with the least expenditure of energy; he should place the patient in the position which in passive movements will afford the ut-

most passivity and in active movements the proper muscular isolation.

At first but little force or duration is to be used, and a gradual increase is made only as the patient becomes accustomed to the movement.

When applying massage proper, no grease or lubricant is to be used (except in a few instances mentioned in Part II), unless the patient's skin is dry and scaly. Always apply as large a surface of the hand as possible, as this wili increase the effect and save time. For more convenience divide the body into convenient spaces—from articulation to articulation—and finish one space before proceeding to the next. The general direction of the manipulations should be such as to favor the venous currents—usually from the muscle's insertion to its origin; frou the periphery of the body towards the heart.

When only one hand is employed, use the right hand for the patient's right side, the left for the left.

Muscles that are being *masséed* should be in relaxation.

Passive Movements :—

Friction.—Friction is applied on the bare skin; it may be dry or wet, rectilinear or oval. The wet friction, or rubbing with lubricants, is not used by skilled masseurs except when the skin is dry and scaly or when it needs

special medication, and in the few traumatic cases named in part II. Synopsis :

- Friction.
  - Kinds: Rectilinear (dry); Oval (wet)
  - Mechanics
    - Insertion to origin
    - Along nerve or vessel
    - One hand
    - Both hands: Simultaneous; Alternate
  - Effects
    - Skin temperature rises
    - Effusions and exudations pushed along in capillaries
    - Cutaneous nerves: (a) Soothed; (b) Irritated
    - Brain and cord mildly stimulated
  - Uses
    - Introduction to kneading
    - Finish " "
    - Auxilliary " "
    - Primary procedure in special cases.

Friction is applied so that one hand steadies the limb while the other, enclosing the limb with a firm grasp, glides from below upward, and returns in such a manner that the up-stroke is heavy, the down-stroke light. "The manner in which a carpenter uses his plane represents this to-and-fro movement very well" (Graham). The pressure should not be so great as to chafe the skin. The movement can be applied with both hands, one on each side of the limb, so that one hand glides up while the other glides down.

This form is very soothing, especially if the hands describe curves instead of straight lines. Simultaneous strokes of both hands firmly enclosing the limb are occasionally used to remove excessive effusions, as in water on the knee, severe sprains, etc., (see part II); it is then applied with vaseline so as to save the skin. In case it is desirable to hasten the circulation in some particular vein or lymph vessel, this is best accomplished by sliding the thumb along its course, or by placing the cushions of the fingers across it, fingers close together, and rubbing in direction of the little finger (toward the proximal end of the vessel). This mode is commonly used when working on the jugular veins, the operator standing in front of the patient, who is sitting with his head tipped well back and face turned up so as to stretch the *fascia* of the neck. Friction along nerves is done in a similar manner.

It is hardly necessary to describe the friction on every portion of the body; for what has been said above, together with the hints as to position and spacing given under "*kneading*" will enable any intelligent operator to apply this procedure. Besides, friction is so unimportant and is used so little that no particular skill is required.

It may, however, be necessary to describe friction of the abdomen since this differs from that applied to other parts :—

The patient takes sit-lying pos. (fig. 2) with slightly elevated trunk; the operator sits on the patient's right side, partly facing him. He places his left hand edgewise, ulnar border down, at the beginning of the transverse colon, and his right hand similarly at the beginning of the descending colon; then he slides the left hand across the abdomen, and simultaneously the right one in a semi-circle toward the pubic crest, the left hand following, after it has reached the descending colon. The left hand turns an acute angle by pivoting on the little finger, so as to slide from the fingers in the downward movement. Starting from the first position of the hands, the procedure is repeated during five to ten minutes. The movement is best applied over the shirt or other protective covering, as the pressure must be considerable in order to affect the contents of the colon.

By friction the heat of the skin increases, not from chemical changes (as in kneading), but from the impeded motion, the rise of temperature being proportionate to the force of the pressure, the speed and duration of the movement.

The irritability of cutaneous nerves decreases, and consequently reflex irritability also lessens. The movement produces nutritive changes in the spinal cord, increasing its power of activity, and may even act mildly

stimulating on the cerebral functions (Dr. Geo. H. Taylor).

Prolonged friction increases nervous activity, and hence causes a growth of substance in the nerves; so as to lessen the tissues and functions of the muscles, etc. For that reason nervous and excitable invalids should not be given friction or "skin massage," since that would only tend to increase or exaggerate their symptoms. This is well proved by the numerous neurasthenics who have been "rubbed" and only grown worse from the so-called massage treatment.

The rise of temperature causes a dilation of cutaneous blood-vessels with consequent afflux to the surface; the effect, in a mild degree, resembles that of hot applications, *viz.*, a temporary diminution of pain.

Friction is used for its soothing effects as a preparatory measure to kneading, and is then applied gently; sometimes it follows the last named procedure, when the soporific effect of the latter is undesirable, and it is then applied briskly and forcibly. The movement is also used locally to hasten the flow in some particular vein in cases of local congestion, and to cause a suction in efferent lymphatics. On the abdomen it is used as a mechanical irritant to induce peristalsis, and to propel the fæces toward the rectum.

Kneading is executed so that the hand grasps as much muscle as it will hold or as the flexibility of the tissue will permit, and stretches it away from the bone in direction of the venous current, the hand contracting; the muscle is allowed to recoil while the hand relaxes; and the movement is repeated, care being taken not to glide on the skin.

Synopsis:

- Kneading.
  - Kinds
    - Rotary
    - Transverse
    - Vibratory
  - Mechanics
    - One hand
      - whole
      - cushions of fingers
      - tips of fingers
    - Both hands
      - alternate
      - simultaneous
  - Effects
    - Temperature rises 1° to 2°
    - Capillary circulation increases
    - Blood-pressure diminishes
    - Sensory irritability lessens
    - Mental activity "
    - Gentle stimulates
    - Hard lessens
    - growth
  - Uses
    - For general effects on circulation and neurition
    - Locally
      1. To reduce swellings and effusions
      2. To cause trophic changes
      3. To prepare for resistive movements

The greatest pressure should occur while the hand moves with the venous current, the object being to squeeze the blood out of the capillaries into efferent veins. Whenever possible both hands are used with alternating strokes as in friction, one hand contracting in its upward motion as the other relaxes and moves down. On large muscles, as on the thigh and arm, let the pressure be between the cushions of the fingers and the heel of the hand ; on small surfaces, between the fingers and thumbs. On large flat surfaces the pressure comes from the shoulders and elbows, while the hands are spread flat, fingers together and thumbs abducted. The motion is a graceful curve—usually outward upward—produced by supination of the hand rather than by abduction and adduction of the arm.

Begin at the central end of the part to be kneaded and work towards this end. After giving three or four malaxations in this place, move the hands slightly towards the distal end of the region and repeat the kneading, observing, when taking a new grasp, to let the hands cover part of that which has already been kneaded, so as to make sure that no portion is neglected. Kneading is usually described as beginning below and occuring upward, for instance, from toes to hips, from fingers to shoulders, etc. But it is evident that if the operator

begins above and works upward while gradually moving his hands downward, time and labor will be saved, as he has now a less column of blood to lift at the beginning and is constantly emptying the veins in advance of him, adding negative pressure in the veins to the pressure of the hands. The acceleration of the venous current will consequently be much greater. Besides, if any proximal capillaries or veins were occluded it would hardly be safe to begin the manipulations at the distal end. All writers prescribe this mode of kneading in sprains, synovitis, etc., and there is no reason why it should not be used in all other cases as well.

The manner of applying the hands differs somewhat on different parts of the body, and to make the kneading smooth, agreeable and efficacious, the following positions will be found the most convenient.

Arm. The patient reclines with one hand resting in the operator's lap. The operator sits facing the patient, grasps the biceps in one hand, the triceps in the other, and moves his hands as described above, from shoulder to elbow, applying his pressure upward.

Fore-arm. The hand is in supination. The masseur lets his thumbs follow along the median of the anterior surface, the fingers working on the under side while the thumbs work on the upper side.

Hand. Pronated. Thumbs follow median of dorsal

side stretching the tissues outward upward, while the fingers manipulate the palmar side. The palm may also be kneaded separately with one hand, the cushions of the fingers working from the median outward, while the patient's hand is resting in the operator's opposite hand.

Fingers. One finger in each hand, the strokes being simultaneous; or both hands working with alternate strokes on one finger at a time. This last method requires more skill but is more efficacious.

Thigh. The patient's leg, with semiflexed knee, is resting across the operator's lap. The operator grasps the quadriceps in one hand and the hamstring muscles in the other, stretching the tissues from the median of the inside. On a large thigh it will be necessary to knead the outside separately, and this is best done when the patient is lying face down.

Knee. The joint extended. The cushions of the fingers work on each side of the patella.

Leg. The patient's foot is resting in the operator's lap, the knee being flexed so as to relax the muscles of the calf (cr. *a* pos.). The operator's thumbs stretch the anterior muscles away from the edges of the tibia, while the fingers manipulate the calf. The calf may also be kneaded separately with the patient in prone ly. pos., the foot resting against the operator's waist.

Foot. The cushions of the fingers around the malleoli. The dorsal surface as on the hand. The plantar surface with the fingers of one hand applied at right angles, while the other hand steadies the foot by grasping the dorsal side. The toes as the fingers.

Abdomen. The patient reclines with feet drawn up and supported so as to relax the muscles of the abdomen. The operator sits on the patient's right side, places his right hand across the patient's abdomen and gives a rotary motion, the heel of the hand pressing along the ascending colon and the fingers along the descending colon, the general direction being from the right iliac fossa upward, across and downward, care being taken not to press upon the innominate bones or upon the umbilicus. The hand at the same time performs a slight movement of contraction and relaxation. A transverse kneading of the small intestines can be done by both hands applied parallel across the abdomen, and simultaneously doing a wave-like movement of contraction and relaxation, the pressure alternating from the heel of the hand to the fingers. Deep kneading of the colon can be done by the fingers of one hand, beginning in the left iliac fossa and working downward while gradually moving backward along the colon.

The stomach is sometimes kneaded specially and also the epigastric region by the fingers of one hand.

The liver is kneaded by the right hand grasping the waist just below the ribs, fingers in front, thumb behind, and alternately contracting and relaxing without rotary motion.

Chest. Finger-tips in the intercostal spaces, and the palms of the hands from insertion to origin of pectorals, one hand for each muscle working with alternate strokes.

Back. The patient is lying face down with arms extended sideways (yd. *c* pos.), or hanging over the sides of the couch. This position relaxes the muscles of the dorsal region the best. The operator stands at the patient's head facing him, and works from the spine of the scapula to the sacrum, the thumbs following each side of the spinous processes, the hands spread out with fingers together. The pressure, which is done with the whole hand, should occur in direction downward outward. The strokes are alternate as usual. If the patient is in bed, the masseur is usually obliged to stand or sit on one side. It is then most convenient to manipulate with one hand, the other placed on the top and at right angles to the working hand. (On the right side the right hand is under, on the left, the left); as before, the tissues are stretched from the median, downward outward.

If the glutei are to be manipulated, it may be done by one hand, while the other one works along the spine,

both moving in circles from the distal ends towards the waist where they meet. In this case the strokes are simultaneous.

Shoulders. — Patient sitting, operator stands behind and works with the cushions of his fingers from the acromion, along the supraspinatus, to the spine The strokes may be simultaneous, one hand on each shoulder or both hands may manipulate one shoulder, one resting on the other, fingers crossing at right angles, the right hand under for the right side, the left for the left. The deltoid can be kneaded separately by both hands, the thumbs working from the median upward outward while the fingers steady the hands on the chest and back.

Neck. — Position as for the shoulders. The kneading is applied from occiput to scapula, and from occiput to sternum. For the first manipulation the operator stands in front of the patient; for the second, he stands behind. The neck can also be enclosed in both hands as described for the limbs. The masseur then stands in front the patient leaning forward with his head resting against the operator's chest. The strokes are alternate, the thumbs working from the occiput downward outward

Head. — Patient sitting. The operator standing in front steadies the head with one hand while working with the other from the sagittal suture backward outward, taking care not to glide on the hair. The whole hand is

used over the parietal region and on the vertex, the cushions of the fingers in other places; and the general directions of the manipulations is from the "frontal suture" toward the occiput. Special attention is given to the eyebrows and to the inferior occipital region. The eyebrows are grasped between the thumb and the index finger and squeezed and pressed toward the nasion, both sides being worked with simultaneous strokes, and the hand moving from the nasion outward. The special massage of the eye will be described in another place. The face and nose can be worked with the cushions of the fingers, usually one side at a time, the other hand steadying the head. In special cases the facial muscles may be worked between the thumb inside the mouth and the fingers outside.

Internal massage can be applied to the nose, pharynx, larynx, uterus, rectum, etc., but will not be described here as it requires special training and special skill, and should not come into the domain of the average masseur *

In all kneading remember to bear on hard enough not to glide on the skin, yet not so hard that the tissues become crushed on the bone, nor so as to bruise the capillaries. Make the rotary motions as large as the extens-

* The student is referred for literature on internal massage to Major Brandt's treatise to articles by Dr Graham, Dr Hogner, Prof. Cederschiold, and others

ibility of the tissues will allow, but do not try to stretch a muscle in two directions at once While kneading is best executed on the bare skin, it can, however, be done through the clothing. The pressure must then be heavy enough to prevent the clothing from gliding on the skin. Whenever kneading is used for strictly local purposes, as in sprains, synovitis, etc., it would be a mistake not to remove the clothing Do not put much speed into the circuitous movements, but work leisurely, as it will be found that the massage of the mild and slow type is usually more efficacious than that of the violent and rapid type.

Some nervous persons find the rotary kneading unbearable, and it may then be changed into a rectilinear squeezing, each hand alternately contracting and moving from portion to portion of the limb as in ordinary kneading On large surfaces, as the back and shoulders, the hands may move in a straight line, the tissues being picked up by the thumb and fingers, one hand following the other, and one grasping before the other one lets go

Another form of kneading is the so-called muscle-rolling, which may be used on arms and legs as follows: The hand, with straight fingers, are applied across the limb (at right angles), one on each side, and with a rapid, alternate to-and-fro movement they are made to slide from one end of the limb to the other, the muscles mean

while becoming rolled between the two hands This is often used as a finish off to ordinary kneading Many other modifications may be invented to suit different cases and conditions, and will need no special description.

Effects of Kneading. — The tissues are squeezed like sponges: blood and lymph vessels become alternately emptied and refilled; the venous circulation and re absorption increase: physical impediments to capillary circulation is removed, and the transudation of nutritive supply is favored. Moderate kneading encourages muscular growth, while prolonged or violent kneading diminishes it. The temperature rises 1° to 2° (on account of nutritive changes), the skin becomes more flexible, and insensible perspiration increases. Sensory irritability diminishes, while motor irritability increases. The general blood pressure diminishes on account of the increasing vis-a-fronte in the veins, and the heart-beat diminishes in frequency.

Kneading is used as a general procedure whenever it is desirable to lessen the blood pressure and heart-beat by hastening the venous currents, and the patient is too weak for other forms of passive movements. It is applied locally to venous congestions, transudations, effusions, etc.; to make hardened muscles, ligaments and tendons more pliable; and to prepare muscles for active

work. For it has been proved that fatigued muscles quickly regain the power of contraction when subjected to kneading; and also, that muscles so treated possess greater endurance than if not kneaded (Zabludowsky); *i. e.*: if a muscle is *masseed*, it can contract during a longer period with less fatigue; or during a shorter period with more force without increase of fatigue

While friction reaches merely the superficial vessels and nerves, etc., kneading extends its effects to deeper layers as well, and consequently is far more efficacious than friction.

Circumduction. — Some part of the body describes with its longitudinal axis the surface of an imaginary cone, the base of which is at the free end of the part moved, and the apex at the joint in which the movement takes place (Roth). Some writers (Geo H. Taylor, Ostrom etc.), have erroneously named this movement rotation, which, however, is an entirely different procedure, anatomically and gymnastically.

Circumduction can be active or passive. In all descriptions and prescriptions below, the abbreviation "circ." refers to the passive movement, unless the word "active" precedes it.

Effects of Passive Circumduction. — Prof. Loven states (*Var Tids Forskinng No.* 17 †) that "at the greater number of the articulations, but especially around the hip

† Larobok i Sjukgymnastik by T. J. Hartelius, M. D., Stockholm 1883.

and shoulder-joints, as well as at the lower part of the neck, the superficial part of the walls of the veins is usually fastened on aponeuroses and fasciæ, which by certain movements are extended so that the veins are expanded. This causes in these veins a suction which powerfully accelerates the return current. By the alternate motions of the joints the veins may thus be alternately extended and contracted, filled with blood and again emptied. This is true not only of the extremities, but also and especially of the largest of all the veins, the inferior vena cava, which is so located along the front of the spine that it must follow the movements of the latter. If the thorax be bent forward, this vein becomes highly contracted, again to expand when the trunk is straightened. Experiments have proved that the capacity of the vessel largely increases at such extension It is easy to understand how at every extension, and still more at backward flexion of the trunk, a suction is caused in all those veins which supply the inferior vena cava, especially in those of the lower extremities. A similar condition takes place in the veins of the arms when these are extended sideways and somewhat backward, with the hands closed. Finally, as regards the jugular veins, these are the most extended when the head is bent backward with upturned face."

The flow of the lymph is accelerated in proportion

with that of the blood, the negative pressure, as described above, causing a suction in the thoracic duct and also secondarily in peripheral lymph vessels.

Synopsis

- Passive Circumduction.
  - Kinds
    - Slow
    - Fast
  - Mechanics
    1. One hand steadies moving joint, the other grasps near the next
    2. Speed, less for large limb, greater for small
    3. Duration limited by sensation of resistance
    4. Circle as large as joint permits, or as effect demands
  - Effects
    1. Blood drawn from moving limb
    2. Absorption increased by molecular revulsion
    3. Tendons, ligaments, fasciæ made more pliable
    4. Articular adhesions removed
    5. " cartilage made thinner
    6. Soporific
  - Uses
    1. Diminish blood pressure
    2. Increase return current from any region
    3. Substitute kneading
    4. Prepare for kneading.

It is then evident that passive circumduction is a means of pumping the blood from the region put into

motion. At the same time centrifugal force, increasing with the speed of motion, draws the arterial current into the region. By this means the vis-a-fronte becomes increased both in veins and arteries, and it necessarily follows that as the peripheral resistance diminishes, the heart's action will decrease. Waste matter present in the venous current is carried off with greater speed, and as the movement causes a vibration throughout the part put into motion, venous absorption increases, especially in the vascular tissues of the articulations. Adhesions become broken up and the mobility of the articulation increases.

Circumduction has that in common with all continuous rotary motion of inducing a relaxation of attention — acting as a hypnotic.

The speed of motion is dependent partly upon the mobility, so that the movement is done slowly and tentatively in cases of stiff joints, moderately fast in others, partly upon the object of the movement, so that it is done quite slowly when the effect of increased efflux is the chief desideratum, quickly when the object is to increase the afflux.

The duration of the movement is determined by the muscular resistance which soon occurs in the patient (by fatigue-reflex), and which indicates that the movement has ceased to be passive, *i. e.*, has ceased to produce the above effects.

Whenever it is desirable rapidly to diminish the blood-pressure, circumduction of large articulations is the best procedure. And when passive hyperæmia exists in any region, this movement applied to that region will quickly increase the return current from it. When kneading is to be given to a limb with highly engorged capillaries, it is well to use circumduction as a preliminary measure to produce a suction in the efferent vessels, and so hasten and favor the effects of the kneading. When kneading is applied for its general effects, it may, in a great many cases, be substituted by circumduction, as this saves time and effort, the last-named procedure being less tiresome to the operator, often more agreeable to the patient, and always more far-reaching in its effects. What friction accomplishes superficially, and on a very small scale, kneading will affect on a larger scale; and circumduction will do it still more extensively. (Compare synopsis of classification of medico-gymnastic movements).

Effects of Active Circumduction.—It may be as well to mention these here as a matter of comparison: the venous circulation in the moving part becomes retarded on account of the active contraction of the muscles around the articulation. The afflux increases proportionately to the speed of motion; cerebral influence to the part increases; and the heart's action is accelerated,

partly on account of the increasing arterial resistance, partly by reflex. Prolonged the movement will cause active hyperæmia, which is the reverse of the effect of the passive movement.

We will now turn to a consideration of the mechanics of the principal passive circumductions.

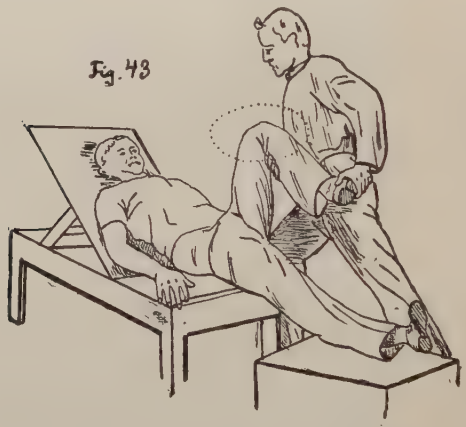
Reclin. F. circ. (fig. 42.) Patient reclining (fig. 8). Operator sits with one of patient's legs across his lap fully supporting it, so as to keep it straight from hip to ankle. To that end the operator keeps his inner thigh somewhat lower, so as to allow for the expansion of the

Fig. 42.

calf; the patient's heel should be fully outside the operator's outer thigh, so as not to interfere in moving. Operator grasps patient's ankle with one hand, so as to steady it, and holding the metatarso-phalangeal articulations with the other hand. he makes the toes describe a circle eight to sixteen times to one side, then to the

other. The movement is done with utmost speed when used for circulatory effects; slowly and tentatively when applied for increase of mobility. It is evident that after sprains, in arthritis, etc., the circumduction must be very slow and cautious, so as not to cause pain or distortion of tissue. The movement is used for its general effects upon the circulation, as well as for local, articular effects.

For the right foot the operator sits on the patient's right side, and does the movement with the right hand; on the left side the left hand should be used. If the patient is in bed, let the mattress support the leg and proceed otherwise as just described.



Cr. a *Reclin. Hip circ.* (fig. 43.) For the left side: Operator in fallout pos. on the right foot grasps patient's

foot with his left hand in the hollow of the foot, thumb on the inside ; the other hand grasps the leg from behind, and just below the knee, fingers on the inside* (without pinching or squeezing, merely supporting). The limb is bent at hip and knee and a circumduction is communicated to the hip, by the right hand making the knee describe as large a circle as possible, first to one side, then as many times to the other. The movement is usually begun outward and also ended outward, the inward circumductions intervening. Care should be taken to keep the joints well bent ; not to let the knee pass the median of the body (so as not to squeeze the bladder), and to keep the foot well inward so as to save the ligaments of the knee. The upper hand does most of the movement, the lower hand merely supports the leg. The movement should be done rather slowly. If the knee is stiff, the circ. must be done with straight leg, the effect then diminishing.

The other leg should be supported so as to prevent the patient from slipping. The patient may be lying instead of reclining. For the right leg, the operator stands on the patient's right side, the left hand becoming the upper one, the right the lower.

The movement increases the return current from the

*Old-fashioned operators keep this hand ON the knee ; but this makes an unsteady movement, and affords less support to the leg.

leg and pelvis, and especially accelerates the flow in the iliac veins. It is used in disorders of digestion and in all diseases where pelvic congestion is a predominant symptom (or a cause). It may also be applied for its general effect upon the circulation, and also as a means of increasing the mobility of the hip-joint.

Str. ly 2 Hip circ. Patient lying with arms extended upward and grasping the edges of the couch (or some other fixed object). The operator stands in stride position facing the patient and grasps his leg just above the ankles. He then swings the patient's legs in a large circle, first to one side, then to the other, taking care to keep the patient's feet together and his knees straight. The operator should try to get his swing from his knees, as this will save his back considerable labor.

The movement increases the vis-a-fronte in the mesenteric veins (and to a small extent also in the inferior vena cava), and produces an artificial peristalsis. The sum total of effect will be increased intestinal absorption, so that the movement becomes very useful in disorders of digestion. It may also be applied in pelvic disorders, although in these the preceding movement is to be preferred.

(Care should be taken not to swing the legs below horizontal, so as not to cause unnecessary tension in the abdomen. The effect can be very much increased by

letting an assistant apply pressure inward upward on the abdomen during the upward movement of the legs.)

Finger circ. (fig. 44.) Operator faces patient and grasps one of his fingers between two of his own (flexed; the 1st phalangeal joint used for grasp), and while supporting the metacarpo-phalangeal articulation with the other hand, he moves the patient's finger in a circle a number of times each way. The speed and sphere depend on the mobility of the joint. The right hand gives the movement to the patient's right hand, the left to the left.

The movement is used only as a local procedure in arthritis, sprains, etc.

Fig. 44.

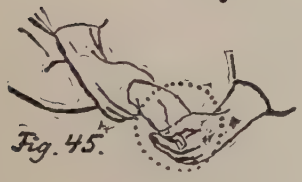


Fig. 45.

Fig. 46

Hand circ. (fig. 45.) Patient reclining, sitting, or standing; operator stands on one side of him, facing the same

way. Grasp with proximal hand just above the patient's wrist, and from its palmar aspect, the operator's forearm crossing the patient's and holding it against the operator's chest (for better support). The distal hand (right for right side, left for left side) grasps the patient's clenched fist from its dorsal side, so that the operator's thumb crosses the patient's at right angles, the fingers resting over the latter's fingers. (The operator's hand is flexed chiefly at the metacarpo-phalangeal articulations, the fingers being nearly straight, and thumb and index finger meeting.) This hand is now moved in a circle first to one side, then to the other, — rapidly if for circulatory effects, slowly if for articular. The movement is used chiefly to promote mobility of the wrist, to break up adhesions, and polish articular cartilages, etc. It is then well to press the articulating bones firmly together while moving, so as to make sure of a steady movement.

Bent A circ. Patient reclining. Operator sits facing him and places his distal hand (left for the right side, and *vice-versa*) as a support under the patient's elbow; the other hand grasps the patient's forearm just above the wrist and makes the hand describe a fairly large circle, the elbow being bent throughout the movement. The circumduction produces a changing flexion of the elbow and a rotation of the humerus. Effects on circulation are slight, but the head of the humerus is rubbed under the

acromion, and adhesions and thickenings of cartilage and tendons become worn off. The movement then is useful in arthritis and periarthritis of the shoulder.

Yd. c. *Sitt. A. circ.* (fig. 46.) Patient sitting. Operator stands behind to one side, places his proximal hand (left for right side) on patient's shoulder to steady it, grasps with his distal hand just below the patient's elbow and makes the arm describe a large circle upward backward, downward forward. The distal hand grasps from underneath (palm up) without squeezing or pinching. The arm should not be allowed to flex at the elbow, and it should be moved in only one direction, as the reversing would tend to compress the chest. The alternate extension and relaxation of the veins around the joint causes a suction in its afferent vessels, so that the movement becomes a means of pumping the blood out of the arm, doing for the large vessels what kneading of the arm would do for the smaller. The movement is used for its effect on the general circulation ; as a local procedure to prepare, increase, or substitute the effect of kneading ; also to break up adhesions in the shoulder. When used for circulatory effects, the circumduction is rather rapid ; when used for articular effects, quite slow. (Compare hand circ.)

Str. sitt. A. circ. (fig. 47.) Patient sits with arms extended upward. Operator stands on the couch behind

with his leg and thigh supporting the patient's back. He grasps the patient's hands so that he has hold of the patient's thumbs, the patient of his (the patient turns palms inward, the operator palms outward), and while stretching the arms well he moves them in a small circle forward outward, backward inward, taking care not to strike the arms against the head and not to rotate them outward. The movement is not reversed, so as not to compress the chest.

Fig 47.

Fig. 48.

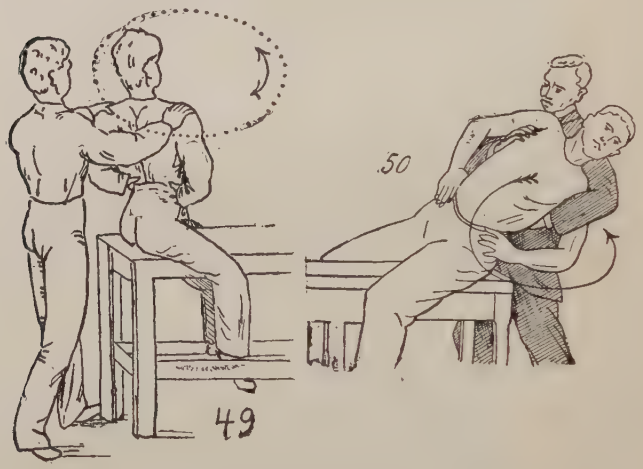
The chest becomes highly expanded, a suction arising in the superior vena cava and in the pulmonary artery; meanwhile the blood is drawn out of the arms, and the apex of the lungs are brought into vibration. The total effect will be an increase of pulmonary circulation, and

bronchial absorption; the mechanical afflux to the chest causes a diminution of the general blood pressure and makes it negative in abdominal and pelvic vessels. The more the trunk inclines backward (reclin. and ly pos.), the greater will be this last-named effect, for now the muscles of the abdomen become tense, the arch flattens and forces viscera upward. The str. ly 2 A. circ. will then be of exceptional value in abdominal and pelvic congestion, while the str. sitt. 2 A. circ. is more useful where pectoral expansion is the chief desideratum. The movement from reclin. pos. has effects midway between the two, and would be preferred as a general movement for circulatory effects.

A modification of the movement (with reverse direction of motion) is shown in fig. 48, the arms bending and stretching while the hands describe circles as before. Its chief utility is in muscular rheumatism of arms and shoulders, when the patient is able to bear so violent a movement.

Wg. ride sitt. T. circ. (Fig. 49.) The patient sits astride a high couch with feet fixed (or astride a chair with feet under a bureau, or radiator, etc.) and hands on hips. Standing behind, the operator grasps the patient by the shoulders and moves the latter's trunk rather slowly in a large circle several times in one direction, then in the other, and repeats as required. The circle

should not pass backward beyond the vertical commencing pos., as this would tend to compression of the chest; and the patient should make the effort of keeping back and neck erect. The movement causes a suction in the inferior vena cava (see above), and alternately compresses and distends the mid-abdominal viscera, increasing the vis-a-tergo of their venous supply; so that there is a duplicate hastening of the return current from this region. The movement, then, becomes useful in cases of ab-



dominal (and pelvic) hyperæmia, and is a much used exercise in disorders of digestion. If some degree of speed be put into the movement, cerebral congestion will result,

centrifugal force driving the blood to the part nearest the periphery. In this way the rapid movement becomes useful in cases of cerebral anæmia, cortical malnutrition, etc., and may be indicated in certain mental disorders.

It should not be forgotten that the vertebral veins are put into oscillatory extension, so that their contents become emptied with greater speed.

Wg. ride reclin. T. circ. (Fig. 50.) The patient sits astride the high couch with feet fixed and hands on hips. The operator stands in stride position behind the patient and close to him, places one hand under the patient's axilla, and lays his other arm over the patient's other shoulder. The patient reclines against the operator, who puts his hand through the space between the patient's arm and thorax, and rests it in the small of the latter's back. A circumduction now takes place forward outward ten to twenty times. To reverse, the grasp is changed, so that the movement always occurs to the side of the over-grasping arm. The circle should not pass the median (vertical of com. pos.), and should not be laid too far forward. The patient should be fully supported throughout the movement, so as not to be forced into muscular effort of the abdomen for equilibrium. In absence of a high couch, the movement can be done with the patient astride a chair with feet fixed (as above). The operator then kneels upon one knee

(the knee of the side to which the circumduction occurs), this knee being placed on the floor in a line with the median of the patient's body. It is exceedingly tiresome for the operator to give the movement in this situation, but it is too useful to be omitted in absence of the high couch.

The vascular negative pressure is similar to that of the preceding movement, but located somewhat higher, the effect being chiefly upon the portal vein. The chest and abdomen become more extended than in the preceding movement, giving more thoracic aspiration and pelvic venous vis-a-tergo. Also, the patient is entirely passive, so that there can be no increase of arterial pressure (of which there is a trace in the preceding movement). The exercise is a favorite with a majority of operators.

1-2 *Rest ride reclin. T. circ.* (Fig. 51.) Resembles that just described, except that the patient's distal arm (side of the circ.) is placed with hand behind the neck. This gives a stronger tension in the chest on that side, the focus of effect becoming located higher (hepatic veins?); and there is more internal elevation (*i. e.*, viscera are more forcibly drawn up).

1-2 *Str. wg. ride reclin. T. circ.* (Fig. 52.) Patient on the high couch with one arm in wg. pos., the other in str. pos. Operator stands behind, facing to the side of

the patient's str. arm, and with his corresponding foot (left for left) slightly advanced. He places his proximal

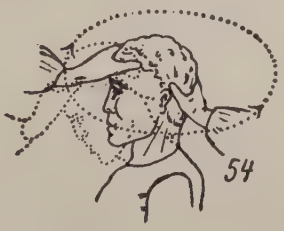
arm across the patient's back, the hand in the axilla, and with his other hand (pronated) he grasps the patient's str. arm just below the wrist. The patient now reclines over the operator's proximal arm, with his head leaning against the latter's chest, and the operator gives a circumduction outward, backward, upward, by making his whole body move, so as to retain his contact with the patient. To reverse, the operator faces the opposite way, and grasps correspondingly. To make the motion smooth, keep a very flexible knee, and let the distal

hand merely steady the patient's arm without pressing on it.

The movement is an exaggeration of the preceding, the three forming a sequence of progressive steps from the "gentle to the strong," if such an expression can be used about passive movements. At all events, the extension of the chest is quite forcible in the last movement, giving more thoracic aspiration, and the alternate compression of the liver is much more complete (in the circumduction to the right side). The movement is introduced into the prescription only after the other two have ceased to be effective.

Str. gr. st. T. circ. (Fig. 53.) The patient stands grasping the horizontal bar (or other stationary apparatus) with hands in over gr., and somewhat less than shoulder-width apart. The operator stands to one side, and, placing one hand on the patient's abdomen, the other on his sacrum, he makes the patient's body describe a circle six to ten times to one side, then to the other, the patient retaining his feet on the floor and keeping his head well erect. The tension in the arms causes a chest-expansion much in excess of that in the preceding, and the venous currents are forcibly drawn toward chest and arms. The afflux increases towards the middle of the abdomen; the pressure in pelvis and legs diminishes;

and the movement becomes a powerful means of increasing the nutritive metamorphosis in liver and stomach. It is an excellent procedure for constipation and dyspepsia, if the patient is not too weak for such intensity of motion. The effect of internal elevation is forcible on account of the position of arms and chest, and can be made still stronger by pressure from the anterior hand; so that the movement might also be useful in certain female diseases.



Sitt. H. circ. (Fig. 54.) The patient sits erect (fig. 10.) with his hands on his knees, the operator standing on his left side and grasping his head between his hands, one on the forehead, the other under the occiput. The

operator makes the patient's head slowly describe a large circle eight to ten times to one side, then to the other, etc.; the anterior hand furnishing the backward movement, the posterior one the forward and sideways motions. The head should not be rotated, but the face should be turned straight forward throughout the movement. When stopping the movement, keep the patient's head steady in upright position before removing the hands, so as to prevent dizziness.

The fascia of the neck becomes alternately stretched and relaxed, and with it the vessels around the neck, especially the jugular veins: the movement becomes a means of pumping the blood out of the head, releaving cerebral hyperæmia. The circulatory revulsion in the brain causes a diminution of attention, a lessening of mental activity; and experience has proved the movement to be an excellent hypnotic.

The muscles around the neck are stretched and relaxed (especially the sterno-mastoids, the scaleni, and the trapezii), removing rigor in muscular rheumatism; torticollis, etc.; and the gliding of the occipital condyles in their sockets tends to heighten the mobility of the occipito-atloid articulation, making the movement of good use in rheumatoid arthritis involving this joint.

If the movement is given with considerable speed, the arterial current is driven toward the head with increased

speed, which effect becomes useful in cerebral anæmia. On the other hand H. circ. should be avoided altogether in hemiplegia, paraplegia, etc., unless it is given with the utmost precaution.

From the above it will be seen that friction, kneading, and circumduction, all affect chiefly the venous currents, the first the superficial ones, the second those somewhat deeper, and the last the deepest; that they are movements of resorption; that they can substitute each other; that circumduction and friction are both excellent introductory measures to kneading in cases of oedematous effusions, extravasions, etc.; that either of the three are suitable procedures to apply to any given part to draw the blood from it; that they are as useful to lessen the general blood-pressure, and so secondarily diminish the heartbeat; and that, no volition being involved, the movements favor general relaxation, and so become useful in a large number of cases of overworked "nervous" invalids, who need the effects of exercise, but who lack the strength necessary for active gymnastics.

It should be stated in conclusion that skilled operators never use kneading where circumduction will do, but reserve the former for special (local) massage; and that they use friction very sparingly, and in the majority of cases not at all.

On movements of neurition in general.— Whenever an impulse passes through a nerve, it is transmitted by vibration, a condensation wave travelling through the axis-cylinder from end to end. In normal condition of the nerve its wave has a definite maximum and minimum speed and density; in disease, these two factors change, *i. e.*, the irritability of the nerve decreases or increases. The experiments of Drs. Granville, Berghmann, Tigerstedt, etc., as well as the experience of all skilled masseurs, make it safe to state that all sharp shooting pains correspond to excessively rapid, sensory waves, while dull, continuous aches correspond to slow and dense waves; that quick, incoordinated movements are caused by a too rapid motor radiation, while abnormally weak and unsteady movements result from slow waves; and that sensory or motor paralysis is the expression of non-vibration, or at least absence of a strong enough wave to connect periphery and centre.

It has been shown (Zederbaum) that a sudden and heavy pressure on a nerve rapidly decreases its irritability; and a pressure, gradually increasing to the same degree, causes a slower, and less perfect diminution of irritability. And repeated experience in sciatica, trifacial neuralgia, etc., proves that, if continued with sufficient force and duration, pressure upon sensory nerves

at first causes an increase of pain quickly followed by anæsthesia. That is, pressure upon a nerve annihilates the possibility of its vibration, and is then indicated whenever it is desirable to diminish the irritability of sensory or motor nerves—generally, to regulate abnormally rapid vibrations. (Luderitz states that motor fibres are affected more quickly than sensory ones.)

Experiments with percussion have shown that light percussion of sensory nerves causes an increase of pain, soon followed by its diminution, and finally total cessation; that slow and heavy percussion causes exhaustion of the nerve; that light percussion for a short period on motor nerve increases the contractility of corresponding muscle; and that prolonged percussion produces paralyzation. It has also been shown that rapid, springy blows break up a dull ache, while slow, dull blows relieve shooting pains.

If a string were in rapid vibration and a slow wave were sent into it, the second wave would break up the first, an average of the two resulting. Just so the dull percussion and pressure are related to shooting pains and spastic movements; while the rapid percussion would bear the corresponding relation to dull aches and akinesia.

If a whole limb has become paralyzed, it would be an

endless task to give percussion to the several nerve-branches affected, and it is then far simpler to put the whole limb into vibration at once, when all its nerves will become affected by the molecular revulsion. The movement of vibration is used in that manner as a multiplication of percussion to reach larger areas and to substitute percussion where the latter cannot be applied.

In motor nerves impulses travel from centre to periphery, and it may happen that the wave starts with normal rhythm, but changes on account of the plasticity of the nerve. It would then save time to apply the manipulations from periphery to centre, so as to produce a peripheral wave that may blend with the central one, making continuous undulations from end to end, while it would take longer to produce this result if working from centre to periphery. Practical experience seems to confirm this theory, even in cases of paralysis of central origin.

On the other hand, in sensory nerves the object of mechanical interference is to prevent the impulse from reaching the central end, and it will then be a saving of time to apply the procedure at this end first and work towards the periphery. In cervico-brachial neuralgia, extending into the serratus magnus and down to the elbow, pressure on the brachial plexus over the first rib

stops the pain much more quickly and effectually than pressure beginning at the elbow and moving up. Likewise in sciatica, pressure from the gluteal region downward will accomplish far more in a shorter time than pressure beginning below and working upward.

We then arrive at the following general rules: a) To lessen neural activity, give pressure or prolonged percussion; to increase it, give brief percussion or vibration. b) For motor disturbances work from periphery to centre; for sensory disturbances from centre to periphery.

Pressure is entirely local in its effect, percussion somewhat more extended, and vibration is quite general, these procedures having the same inter-relation as friction, kneading, and circumduction.

Extension of nerves is also a valuable procedure, having effects similar to those of pressure, moderate extension increasing the irritability, prolonged extension diminishing it (Tigerstedt). In the treatment of sciatica, or whenever the nerve can be stretched without surgical interference, this procedure is even more valuable (for permanency of effects) than any of the preceding.

Pressure.

Synopsis : —

PRESSURE.

- Kinds :
  - Stationary
    - continuous.
    - intermittent.
  - Translatory.
- Mechanics :
  - Cushions of fingers.
  - Knuckles.
  - On nerves.
  - On vessels.
- Effects :
  - a) Increase
  - b) Inhibition

  } of nerve-vibration.
  - Local increase of
    - blood-pressure.
    - absorption.
- Uses :
  1. Sedative in neuralgic pains.
  2. To cause local paralyzation of muscle.
  3. " " secundary increase of circulation.
  4. As substitute for heavy percussion.

Pressure is given on nerves or vessels with the tips [cushions] of the fingers either applied rather suddenly, and steadily increasing in power, or intermittently to form a local vibration. It may be applied along the nerves so that the hand moves from place to place and presses at each stopping ; and it may be given by the knuckles, when it must reach through thick muscles.

The first effect of continuous pressure on sensory nerves is pain, followed by loss of sensibility ; on motor nerve first tremor of corresponding muscle, later its paralyzation. The effect disappears slowly, and will, if reproduced with sufficient frequency lead to a permanent change of neural activity, so that the procedure becomes a means of stopping neuralgic pains and of their permanent removal ; also of stopping abnormal muscular contractions. Intermittent, or vibratory pressure, increasing or producing vibrations of the axis-cylinder, becomes a means of breaking up local anæthesias and of stimulating paralyzed motor nerves, and may in this manner serve as a substitute for percussion or vibration when an extremely local procedure is needed.

Pressure may also be applied on veins or arteries as a means of temporarily increasing the blood-pressure, and so cause a hastened flow when the hand is removed ; or to cause a temporary diminution in arterial supply to congested or inflamed parts. The compression of arteries is however too delicate a procedure for the average operator, and he is advised to leave it alone, as also not to attempt nerve pressure until he is absolutely sure of finding the nerve, so that he will not instead bruise the walls of adjacent arteries, and so produce a worse condition than that already at hand. Masseurs are

also reminded that nerve-pressure is contra-indicated in neuritis.

Below are described the main forms of local nerve-pressure:

On the head. — TRIGEMINUS, frontal branch Face the patient. Steady the hand by the fingers on the temple, and press the cushion of the thumb on the supraorbital notch inward upward (The notch is found by drawing a vertical line from the inner corner of the eye.)

Malar branch : steady the fingers under the occiput ; press the cushion of the thumb on the infraorbital foramen upward. (The foramen is found by drawing a vertical line from the corner of the eye.)

Mental branch: steady the thumb under the jaw, and press the index finger on the mental foramen (found by a vertical line from the corner of the mouth.)

Gustatory branch : steady the little finger under the symphysis of the jaw, the thumb on its outer surface near the angle ; roll the index finger in under the jaw and press it against the inner surface at a point marking the first third of the distance from angle to symphysis. — These procedures are used in trifacial neuralgia, etc.

FACIAL nerve : press the index finger on the inferior maxillary bone just under the condyle at a point level

with the margin of the lobule of the ear. — Used in facial neuralgia.

PNEUMOGASTRIC nerve : press the index finger in the groove between the condyle of the jaw and the mastoid process.

On the neck and shoulders. — CERVICAL PLEXUS : along the margin of the trapezius from the occiput to the level of the fifth cervical vertebra. — Used in cervical neuralgia.

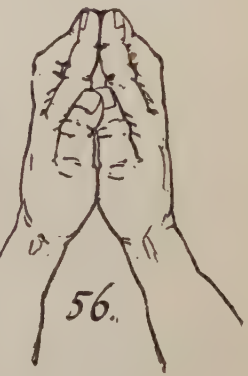
SPINAL ACCESSORY nerve : press the middle finger into the superior border of the trapezius at a point marking the first third of the space from the spinous processes to the outer margin of the acromion. — Used in myalgia of the trapezius, etc.

On the trunk. — DORSAL AND LUMBAR nerves : press the middle finger into the grooves between the transverse processes (fig. 57.) — For back-ache, etc.

INTERCOSTAL nerves : press the tips of all the fingers into the intercostal spaces from the angles of the ribs to their sternal extremities. — For intercostal neuralgia, asthma, etc.

BRACHIAL PLEXUS : steady the fingers on the shoulder (right hand for the left shoulder) and press the thumb on the first rib just back of the anterior curve of the clavicle. — Used in brachial neuralgia, writer cramp, etc.

PNEUMOGASTRIC: patient in Cr. reclin. pos, (fig. 55). Operator stands in front and presses the fingers of both hands into the epigastrium inward and upward while the patient is exhaling (Ask the patient to take a deep inhalation before pressing.) The fingers should be placed so that the tips form a flat surface (fig. 56.) and the hands should steady each other. This movement is spoken of as substernal pressure. — Used in flatulency, heartburn, etc.



The gastric branches can also be pressed by the fingers of both hands rolled in under the ribs in the left hypochondriac region. Care should be taken not to press on the apex of the heart. — Used in dyspepsia.

THIRD SACRAL, vesical branch: patient cr. reclin.

Operator in front; hands as for substernal pressure. Press above pubic crest into the pelvis and slightly upward, first at the median, then about an inch to each side. — Used in incontinentia urinae.

On the upper extremity. — MEDIAN nerve: press tips of fingers in the groove between the biceps and the triceps (taking care not to bruise the brachial artery) from axilla to internal condyle. For the INTERNAL CUTANEOUS nerve give the pressure a little farther back and for the ULNAR still nearer the triceps. The ulnar nerve can be followed from the inferior margin of the pronator teres to the annular ligament about three-fourths of an inch from the inner margin of the forearm; and the RADIAL can be followed from the outer margin of the biceps' tendon along the inner margin of the supinator longus about half way down the forearm (after that it passes *under* the radial artery and cannot be reached except through this vessel.) The MEDIAN nerve cannot be reached very well on the forearm on account of the thick covering of muscles; but it becomes superficial after passing under the annular ligament and can then be found at the middle of the first metacarpal bone by rolling the index finger around the margin of the abductor pollicis.

The CIRCUMFLEX nerve can be compressed by the index finger just below the insertion of the deltoid, also at

the posterior margin of this muscle half way between the latissimus tendon and the deltoid insertion.

On the lower extremity. — Anterior aspect. SECOND LUMBAR nerve, external cutaneous branch: press the index finger just below the anterior superior spine of the ilium in the groove between the sartorious and the tensor vaginæ femoris.

ANTERIOR CRURAL nerve (third and fourth lumbar): press the tips of the fingers from below the middle of poupart's ligament along the median of the inside of the thigh half way down (along the margin of the rectus femoris.) The INTERNAL SAPHENOUS branch can be conveniently reached in the fossa just above the inner cordyle of the femur between the sartorious and gracilis; then it can be followed from below the inner tuberosity along the inner margin of the tibia to the annular ligament.

The ANTERIOR TIBIAL nerve can be followed along the outer margin of the tibialis anticus from the level of the tubercle of the tibia to the annular ligament.

Posterior aspect. The GREAT SCIATIC nerve: press the tips of the fingers midway between the tuberosity of the ischium and the great trochanter and follow this line to below the margin of the gluteus maximus, (fig. 58.) This groove, formed by the biceps and great trochanter, is easily found by dividing the distance from the latter

point to the coccyx by three and pressing inward on the line marking the first division.

SMALL SCIATIC nerve: press the index finger along the margin of the gluteus maximus and turn a semi-circle into the middle of the thigh.

INTERNAL POPLITEAL nerve: Flex the knee. Press the middle finger into the popliteal space midway between the hamstrings and in direction of the centre of the patella.

57.

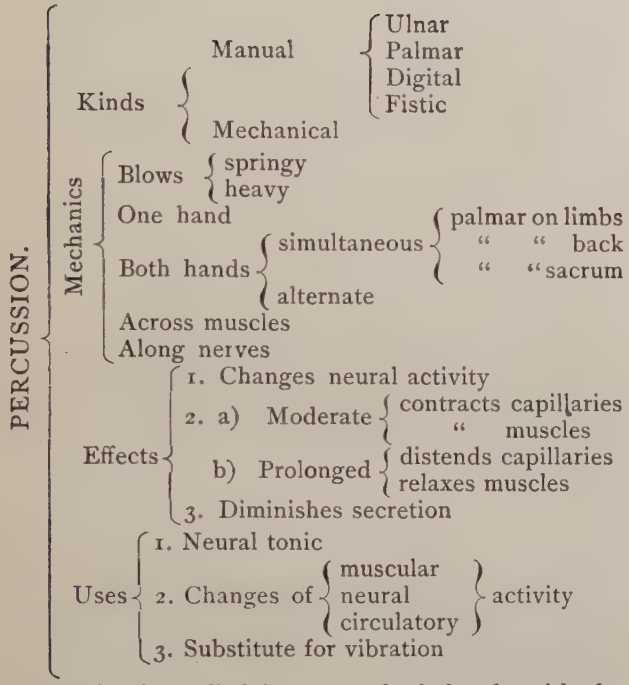
58.

POSTERIOR TIBIAL nerve: press the finger tips along a line curving from the centre of the popliteal space to behind the inner malleolus.

INTERNAL PLANTAR nerve: press the index finger just below the inner malleolus on a line from this bone to the angle of the heel. There is a corresponding point of pressure below the external malleolus for the musculo-cutaneous nerve. The internal plantar nerve can also be reached by the index finger just behind the ball of the foot on a line from the first interphalangeal space through the middle of the heel; and the EXTERNAL PLANTAR nerve can be pressed behind the ball of the foot on a line from the last interphalangeal space through the middle of the heel. This point is a little farther back than the one just mentioned.

Percussion. —

Synopsis :



Percussion is applied by one or both hands, with the ulnar border of the little finger; with the palmar aspect of the fingers; with the tips of the fingers; or with the clenched fist; for simultaneous or alternate blows. It may also be given by instruments known as "percussors" "percuteurs", etc.

The object of percussion being to produce a vibration

in the tissue submitted to it, the stroke should be quick and springy. The heavy blow is used by some operators to cause a slow nerve-vibration; but as it bruises the tissues and is unnecessarily painful, it is best substituted by intermittent pressure, and for that reason will not be described here.

Percussion is applied along nerves to change the vibration of their axis-cylinders in accordance with what has already been stated under "Movements of neurition in general." The same paths of movements are used as have just been described under "pressure".

Moderate percussion increases the irritability of nerves, and has proved an excellent means of arousing sluggish, sensory or motor nerves of neurasthenic and paretic invalids where other procedures have failed to produce any visible effects. On the other hand prolonged percussion leads to paralyzation, and may be used for nerves that cannot be reached by pressure, as for instance in trifacial, intercostal, and other neuralgias. It is to be remembered that, when percussion is applied for local purposes, it must be alternated by kneading in order to prevent soreness and inflammation of the superficial tissues, prolonged percussion causing vascular dilatation. It should also be borne in mind that percussion for sensory effect is applied from central to peripheral end, while for motor effect it is given in the

opposite direction, (see page 67.

Moderate and gentle ulnar percussion applied across muscles increases their contractility and is an excellent preparation for assistive and resistive movements when the muscles are loose and flabby, atrophied from non-usage or disease, etc. On the other hand, forcible and prolonged percussion on muscles and tendons will loosen these and so overcome contractions and retractions, as well as rigor from paralysis, over-usage, arthritis, etc. If both hands are used for percussion of muscles, the blows should be alternate, so that the wave produced by one hand may not be broken by that from the other. Besides the speed of vibration from the alternate strokes will be twice as great as from the simultaneous or from those of the single hand.

Moderate or gentle percussion causes contraction of the blood vessels; prolonged or forcible percussion causes their dilatation (Golz), so that the procedure becomes a means of removing or producing hyperæmia. In that manner percussion is used to drive the blood out of parts which cannot be conveniently reached by other procedures (head, heart, lungs, liver, pelvis, etc.), and also becomes valuable when it is desirable to flush a region as a means of enhancing the resorptive effects of kneading and circumduction (as in sprains, synovitis, etc. of long standing). When used for circulatory effects, percussion is applied with the palms for cutaneous vessels; with the ulnar border of the hands for deeper vessels; with the fingertips for vessels covered by thin lamellæ of bone; and with the clenched fist for vessels covered by heavy

muscles or thick bone.

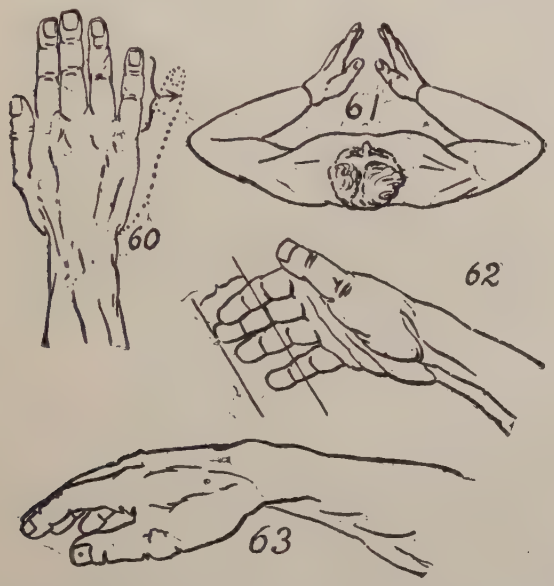
Through its effects upon the circulation, percussion secondarily increases absorption. Experiments also tend to prove that the procedure diminishes secretion in glands submitted to it. At least, it has been shown repeatedly that percussion of the liver lessens the excretion of bile into the intestines.

Percussion is sometimes used as a substitute for vibration, where small areas are to be put into motion and a strict localization is not called for.

Rubber-tipped mallets and rubber balls with elastic handles are convenient aids to produce light, highly elastic and well localized blows; especially if the procedure has to be continued for any length of time.

Back-percussion.— a) ULNAR (Fig. 59) Patient standing with hands on the back of a chair or other support;

back slightly bent forward and elbows somewhat flexed. Operator stands behind and applies a rapid hacking movement with the ulnar borders of his hands, one on each side of the spinous processes from above down (from the spines of the scapulæ to the sacrum). The blows in all



ulnar percussion are given by the last two phalanges of the little finger (fig. 60), the other fingers acting like a spring, being spread apart at the start, meeting and rebounding at the concussion. The stroke should not occur from the elbow, nor should it be a radio-ulnar flex-

ion, but should be the result of supination and pronation of the forearm. To that end the elbows are lifted and turned out and the wrists are extended (fig. 61). To move the hand from place to place (especially in back-percussion) it is more convenient to retain the relative positions of shoulder, elbow and hand, than to disturb the ultimate fulcrum, the shoulder, so that in back-percussion the operator's whole body moves down by bending the knees (from wlk. b. position).

The blows should be as rapid as possible, and no part of the spine should be skipped; and the procedure should be repeated from above downward six to ten times. The patient may be lying down during the procedure, which then becomes less efficacious.—The movement produces vibration of the spinal cord and especially of the sensory nerve-roots; spinal vessels are also put into vibration; and the total effect is one of molecular revulsion in spinal veins and nerves, diminishing spinal congestion; causing nutritive changes in the cord; and relieving those conditions which prevail in nervous fatigue from spinal exhaustion. The procedure is a most efficacious neurotonic, useful in all cases of nervous depression where massage is indicated. Many operators, even, have become so convinced of its utility in a multitude of cases that they begin or end nearly all their prescriptions with this procedure.

When ulnar percussion is applied to the back for muscular effect the patient should be lying down in a position most favorable to relaxation of the muscles and the blows should be applied transversely from above down, or from below up, first on one side of the spine, then on the other.

b) PALMAR back-percussion : Position of patient and operator like the preceding. The blows are given by the palmar surface of the fingers (fig. 62) from perfectly loose wrist (fig. 63) oscillating in dorso-palmar extension and flexion. The strokes are alternate and otherwise resemble those of the ulnar percussion. The blows may be continued down on the glutei and should then be simultaneous below the waist-line. The procedure has less effect on the spinal nerves, more effect on cutaneous vessels and nerves, and resembles very much a cold shower, both in sensation and effect. The movement is more violent than the ulnar percussion, and hence less suitable for feeble invalids.

Chest percussion. — Patient takes str. gr. arch st. pos. (fig. 64) or in absence of apparatus shelter position (fig. 65). The operator stands in front and applies simultaneous palmar percussion to the back from the spines

of the scapulæ downward outward as far as the end of the twelfth rib (fig. 66) and repeats this three or more times; then he gives alternate ulnar percussion to the

chest from the middle of the sternum obliquely upward, one hand on each side (arrows in fig. 65) and repeats this three or more times, when the procedure begins on the back again and is repeated in its entirety three to six times. The front percussion can be made alternate palmar instead of ulnar, the hands giving sliding blows upward outward. This form is gentler and more agreeable to the patient and consequently more suitable for very

weak patients. It is however much more difficult to apply.

The commencing position provides for tense muscles, so that the blows produce a vibration reaching through the chest-walls into the lungs. (The posterior muscles being very thick, it is necessary to give simultaneous blows behind in order to reach through them. In front

however the substratum is chiefly bony and each blow will take effect—here the simultaneous blows would offset each other.) The air-cells and their capillaries are put into oscillation so that a more perfect diffusion (of oxygen and carbon dioxide) sets in: the return current to the left auricle carries blood of a higher oxygen-tension. At the same time the motion produced in the walls of the

air-cells is an imitation (and exaggeration) of their normal function (expansion and recoil); the nutritive processes in the vesicular tissue are stimulated, increasing its tenacity and elasticity. Accumulations of mucus in the bronchial tubes become reabsorbed (this has been repeatedly proved in bronchitis), and respiration becomes deeper and easier. It is essential that the patient should not hold his breath while submitting to the procedure, as this would cause an over-distension of the air-cells. The movement has a wide range of usefulness in lung-diseases (and in conditions of lessened respiration from other causes), and especially in consumption (early stages), bronchitis, and emphysema.

Head-percussion. The patient is sitting with his hands on his knees. The operator stands in front and applies alternate ulnar percussion from the frontal suture to the lambdoid, and from the same beginning point radially outward (also on the forehead to the temporal bones). Next he places himself on the patient's left side, grasps the latter's forehead with his left hand and gives ulnar percussion with the right applied across the head and travelling in transverse spirals from the forehead backward and down along the trapezius on each side as far as the acromion. After this has been repeated three or more times, the operator again places himself in front of the patient and gives digital percussion from before back-

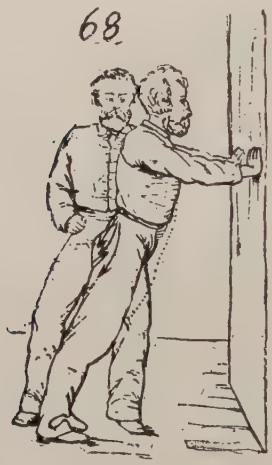
ward and radially to the sides, the hands moving alternately in palmo-dorsal flexion and extension, the tips of the five digits striking simultaneously and near together (fig. 67). The blows should be very light and springy.

The whole procedure is usually finished off by head-vibration (for which see below).—The cerebral vessels are put into vibration; the capillaries contract; the return current from the brain increases (much more than in head-circumduction, smaller vessels being involved); waste matter is carried off with greater rapidity, so that the recuperative processes in the brain can go on with increased power. The movement increases cerebral activity (attention), and gives a peculiar sensation of refreshment and invigoration. It is used in cerebral hyperæmia and is especially beneficial in nervous headaches, and in fatigue from brain work. Its uses in idiocy, lunacy, paraplegia and hemiplegia are as yet in the experimental stages; and the average operator will do well to leave the head alone in the last-named two conditions.

Sacral percussion.—The patient stands facing the wall

(a chair, etc.) with his hands resting against it to steady the trunk. His feet are apart and the toes turned in, so as to steady the pelvis and make the glutei somewhat tense (fig. 68).

The operator stands on the patient's left side with his left hand around the patient's waist for support, and applies a series of blows with his fist on the gluteal region



from the base of the sacrum to the coccyx, and from the same point radially down the glutei (see arrows fig. 68). The hand is lightly closed and strikes elastic blows with the middle phalanges of the fingers, so that it closes more at the concussion, and immediately rebounds by partial extension of the first interphalangeal joint, the air inside

the hand acting like a cushion (the correct blow sounds "as if there were money in the hand", the incorrect blow sounds wooden and heavy). The blows should be quite gentle on the sacrum and gradually increase in power as the hand passes down the glutei; also, while the hand strikes at right angles to the surface above, below it should have a forward upward movement (arrow fig. 69)—The contents of the pelvis are put into vibration; the irritability of the nerves supplying viscera diminishes; pelvic veins and capillaries contract determining a more rapid return current; so that the tonicity of the pelvic contents will be heightened by a repeated application of the procedure. The movement becomes useful in all disorders where pelvic hyperæmia is a cause or a symptom: Diseases of women, disorders of digestion (constipation, hœmorrhoids, etc.), sexual neurasthenia, hypochondriasis, etc., chronic cystitis, etc.; and it is also found exceedingly beneficial for nervous invalids of a generally too high irritability—our experience seems to show that it acts upon the mind, the emotions, much like spanking on a naughty child: the reaction is soothing, all the more so because of the absence of all association of punishment. The procedure is a favorite with most masseurs and appears at the beginning or end of a majority of their prescriptions. (The percussion is sometimes applied with the patient lying down. But this is

much less effective, the relaxation of the glutei preventing the vibration from reaching through the bones. In this situation its usefulness is confined to sciatica and to contractures of the glutei.)

Liver-percussion.— The patient stands with his right hand on his head. The operator applies ulnar percussion with one hand over the floating ribs on the right side forward and backward in a transverse direction, the hand moving horizontally much like a cutting sword.

The movement has repeatedly produced a diminished secretion of bile; and for that reason has been prescribed in diarrhœa, jaundice, etc. The vibration produced in the liver would cause a contraction of its blood-vessels, and hasten the return current, so that the procedure should have some usefulness in hypertrophy of the liver and other disorders of a similar nature. There are, however, no records of the specific effects of this percussion in such cases, even though it has been used and has a scientific reason for existing.

Heart-percussion.— a) PALMAR. The patient takes one-half str. gr. st. pos. with the left hand (compare Fig. 64). The operator stands on his right side, steadies him with the left hand applied in the middle of the back, and applies percussion with the right hand as follows: The whole arm is lifted, the flexed elbow leading, and the semi-closed hand hanging limp. When raised about

a foot, the arm is allowed to drop, the hand leading and striking with the ulnar part of the heel a rebounding blow in the middle of the chest; as the hand rebounds the fingers stretch and give a lingering, stinging, palmar blow toward the left shoulder, the hand gliding down obliquely towards the sternum as soon as the fingers touch (the skilled operator vibrates the hand in a dorso-palmar direction as it glides, so as to still better imitate the contraction of the auricles). The hand in its double stroke moves at right angles over the median of the heart, *i. e.* from the right obliquely upward to the left; and it slides back in the opposite direction. After the stroke of the fingers the arm is raised again for another double stroke, and these follow each other with a speed corresponding to the heart-beat; so that the rhythm of the percussion is the same as that of the heart when the procedure begins, and is then gradually lowered to about 72 a minute, and is kept at that rate for a while before the movement is stopped.

The movement introduces into the chest walls a rhythmical vibration which is gradually communicated to the heart itself whose contractions soon assume the same rhythm. For that reason it is necessary to give the percussion with a great deal of exactness; and it should be continued long enough to keep the heart-beat normal for some time after the procedure has ceased.

It may have to be continued for ten, fifteen, or more minutes, and the operator may have to change hands; but even then he must not change the rhythm, but the left hand should follow the right, or the right the left in uninterrupted succession. The heel-stroke should not be a push, nor a violent concussion, but a swinging, elastic drop with immediate recoil; and the finger-stroke, while stinging, should not leave the muscles sore. Altogether, the arm and hand describe a graceful double spiral; and the movement has to be seen to be understood, as no words or drawings could adequately describe it. It is used in functional and organic heart diseases to lower the pulse, and to assist the propelling power of the heart by adding mechanical stimulus to it. The movement can be given with the patient reclining, the operator sitting on his right side and facing him obliquely.

b) Ulnar. Both hands are used for alternate blows on the middle of the chest in a small circle from right to left (upward, across, downward, across). The speed of the blows is that common in ulnar percussion. The procedure can also be done so that the left hand moves up and down the sternum (to affect the aorta), while the right hand describes a circle over the ventricles and apex of the heart, the blows still being alternate. This movement is used in dilatation to cause a more powerful

ventricular systole, and to secure a better coronary circulation in a weakened or fatigued heart, where no organic changes have taken place. If used at all in valvular disease, it must be very moderate and gentle.

Percussion of the extremities. — a) PALMAR. The limb is supported so as to be relaxed (rest the foot on the seat of a chair; the hand on the back of the chair), and the hands strike simultaneous blows opposite each other one on each side of the limb, the blows to be rapid, springy, and usually travelling from above downward. This form of percussion is used as a finish off in general massage, especially when the massage is given in the morning or daytime, and the patient is not to sleep immediately after it. The effect is highly stimulating on cutaneous nerves and bloodvessels.

Palmar percussion on a small surface is given by one hand as a part of local massage, and may as such be applied anywhere after kneading.

b) ULNAR. The limb should be fully supported, or at least that part of it which is to be subjected to the procedure. The percussion is applied by both hands giving alternate blows across the muscles upward and downward, much after the fashion of chopping meat. It is used to harden loose and flabby muscles: to increase their contractility, and is then applied for short periods at a time, and should be alternated by gentle kneading.

When the procedure is prolonged, it loosens hardened muscles and tendons, and is as such applied to contractures, retractions, and tonic contractions, and may then be alternated by brisk, forcible, and prolonged kneading.

Ulnar percussion may be applied to finger tips and toes when they are numb, hyperæsthetic, or akinetic. It is done so that the finger (toe) to be subjected to the procedure is held in one hand between the thumb and index finger with only the tip projecting above, and the other hand gives the percussion on the tip, the strokes being very light and springy, and parallel with the nail. The movement has great usefulness in various forms of professional neuroses and other disturbances of the paralytic type.

The percussion on the toes is seldom used, but is substituted by percussion with a stick on the ball of the foot, the patient having his shoe on. Three feet of curtain pole, or a policeman's "billy," is the usual implement employed; and with this the operator strikes light and stinging transverse blows on the sole from the toes toward the hollow of the foot (the blows must not pass beyond the sole), while one hand holds the foot across the operator's lap (as in foot circumduction, except that the hand rests against the dorsal aspect of the foot instead of grasping around the ankle.) The procedure is an excellent means of warming cold feet and of stirring

up sluggish sensory nerves, and is used to advantage both in circulatory disturbances and in palsies.

Many modifications of the percussions described are used to suit different cases; but such variations will hardly need description, any skilled operator soon becoming his own best authority in the matter.

Before leaving percussion we would impress it upon the masseur, that this procedure often will do so much more than kneading, that it is well worth the extra exertion for the results obtained. The masseur can never afford to let his personal strength or convenience regulate his choice of movements.

Vibration. —

Synopsis :

- VIBRATION.
  - Kinds
    - Regional
      - tremor
      - shaking
    - Vibratory pressure
  - Mechanics
    - Hands form pivot
    - Longitudinal
      - nerve
      - limb
    - Transverse
      - abdomen
      - liver
  - Effects
    - Molecular revulsion : exchange of tissues
    - Increased mobility
    - Changed neurition
    - Increased venous circulation
  - Uses
    - Stimulant in palsies
    - Counterirritant
    - Resorptive
    - Substitute for percussion

After what has already been said about movements of neurition in general, the above synopsis (Page 95) sufficiently explains the characteristics of vibration without any need of our entering upon a lengthy discussion ; all the more since details will be furnished in the descriptions of special vibrations. Therefore we will enter immediately upon the consideration of these.

Yd. c sitt. A. vibr.— The patient is sitting with one arm extended sideways, the other hand grasping the side of the chair. With both hands the operator grasps the patient's arm just above the wrist (do not pinch, nor squeeze), and vibrates it while gently stretching it. The operator's arms are bent to about 90 °, and the vibration occurs by his fixing his shoulders and arms and producing a rapid tremor in the hands, which becomes transmitted into the patient's arm, and even into the neck and other shoulder, until finally the wave at the shoulder is larger than that at the hand; so that in reality the operator's hands form a kind of movable pivot for the movement. The first stroke resembles a whip-motion, a longitudinal wave being thrown into the arm; and while there is merely a tremor at the hand, the wave at the shoulder should be quite forcible. The operator should be well braced (best in stride pos.), and will find it easier to give the movement if he bends the body somewhat forward. Fatigue sets in very quickly, and it becomes neces-

sary to stop and rest after comparatively few vibrations, before continuing the movement. In this way interspersed with pauses, it is applied for two or more minutes.

The movement sets up a molecular revulsion throughout all the tissues of the arm, emphasizing the phenomena of osmosis and diffusion, hastening circulation and reabsorption, and it stimulates all the nerves of the limb, especially the larger trunks, making it a useful procedure in hemiplegia. The tissues of the shoulder-joint are put into motion much after the type of their inherent molecular vibrations; an interchange of molecules sets in, with loosening of hardened and hypertrophic ligaments and tendons, and of rheumatoid adhesions, so that the movement will be indicated in cases of arthritis and periarthritis. The vibration is communicated into the apex of the lung and affects this organ as would percussion (see chest-percussion), but has none of the severity and bruising effects of the last-named procedure. For that reason in phthisis, etc., with tender superficial tissues, this procedure is to be preferred.

1-2 *Str. reclin. A. vibr.*—The patient reclines with one arm extended upward; the operator stands behind, grasps the arm with both hands around the wrist, stretches it gently and vibrates as just described. In this situation the effect is less in the arm, more in the chest; the pectorals, teretes, serratus magnus, lat. dorsi., etc., are stretched

and vibrated; and it will be found that repeated application of the procedure will permanently make these muscles more extensible and pliable, so that the possibility of pectoral respiration highly increases. The whole upper lobe of the lung is thrown into vibration, so that for pulmonary effect the procedure is much more far-reaching than the one just described. The movement is indicated in hemiplegia, where the axillary tendons are in a high state of contracture; in professional (writer's, etc.) palsies extending into the thoracic branches of the brachial plexus; and in pulmonary disorders. The peculiar sense of rest and relief produced by the vibratory extension of muscles and blood-vessels, and the direct effect upon the circulation of the shoulder region makes this movement very useful in heart-diseases, where the active raising of the arm above horizontal has become a thing of the past (on account of its forcible effect of increasing the arterial pressure). The movement is also useful as a means of stretching the concave side of a dorsal curvature.

Str. reclin. 2 A vibr.—Grasp and pos. as in fig. 47. The vibration is done in the manner already described. The tension in the pectorals is much more severe; and the vibration will be localized chiefly to the middle-anterior chest, the upper portions of the pectorals being relaxed, and the clavicular chest somewhat compressed. The more the trunk inclines backward, the more the ab-

domen will be brought into the movement; so that in this situation the latter will be useful chiefly for dyspeptic invalids of diminished respiratory vigor, and for weaklings with fore-shortened thorax.

As the arms are being stretched upward the vertebræ (through the mediation of the trapezii) become drawn apart—an effect which becomes emphasized if the trunk is erect or inclined forward—and the vertebral veins are put into vibratory extension. The ensuing increased diffusion in these vessels will hasten the removal of waste matter from the cord and spinal nerves, in a manner resembling the effects of kneading and percussion, except that deeper vessels are reached, and that there is none of the jarring of the cord, nerves, and spinal muscles consequent upon percussion, so that the movement becomes a gentle, effective, and agreeable means of removing nervous fatigue due to spinal congestion.

Hand vibr.—The supporting hand grasps as for hand circ. (fig. 45.); the other hand holds the patient's open hand with the thumb crossing the dorsal aspect of the metacarpo-phalangeal articulations, the fingers in the palm of the hand (do not squeeze). Vibrate the hand in a radio-ulnar direction, confining the motion to the wrist joint. Useful in rheumatic gout, sprains, etc.

Finger vibr.—Grasp as for finger circ. (fig. 44) and vibrate the finger from the metacarpo-phalangeal articu-

lation in a transverse direction. Indicated in stiff joints from arthritis, contracture of the palmar aponeurosis, etc.

Cr. b reclin. L vibr.—Patient reclines (fig. 8.); operator stands facing him and grasps his extended leg with both hands just above the ankle and gives a vibration like that described for the arm (see yd. *c* A vibr.), the wave extending beyond the hip into the pelvis and abdomen. The more the trunk inclines backward, *i. e.*, the straighter the hip-joint becomes, the higher the waves will reach into the abdomen; so that for pelvic effect the hip should be semi-flexed; while for effect on the hip-joint it should be flexed to 90 ° or more; and for abdominal effect extended. The effects on the leg are increased reabsorption and innervation, and increased mobility of the hip-joint. When the pelvis and abdomen are brought into the motion, the vessels and nerves of these regions become affected as in (2) hip circ. (see pages 45 & 50), except that smaller vessels are brought into play, and that viscera and their nerves are more directly acted upon. The movement has proved useful in pelvic congestion with consequent obstruction of menstrual passages and general atonicity of carrying ligaments, and other organs; and it can be endured far better than hip-circ., external or internal massage, or similar procedures. Like all vibrations of large regions it produces a sensation of local rest and general relief, and will for that

reason prove of great value in the medico-gymnastic treatment of gynæcological cases. It has also given good results in constipation and hæmorrhoids, where for some reason abdominal massage and sacral percussion could not very well be applied.

Cr. a L vibr.—Patient in reclin., sitt., or better still, 1-2 sitt. pos. (fig. 14). Operator stands to one side, rests one hand (right for the left side) on the patient's thigh, grasps the patient's foot with the other hand, the palm against the hollow of the foot, thumb on the inside, and vibrates this leg at the knee-joint, taking care to keep the thigh steady. The movement is used to loosen adhesions, and to adjust menisci, displaced by arthritis, etc., and is then best combined with a gentle rotation (usually rotation inward), occurring during the vibration. It reaches the interior of the joint and has practically no effect whatever on the circulation and innervation of the leg or thigh.

Foot vibr.—The grasp is similar to that of foot circ. (fig. 42), and the movement resembles hand vibr., except that it is much more restricted, the ankle being a saddle-joint, while the wrist is condyloid.

The toes may be vibrated as the fingers; and this movement as well as the foot vibr. may have some usefulness in arthritis and gout, although kneading and percussion probably will accomplish more in a shorter time

without being enough more violent to warrant the substitution. The vibration of feet or toes should be used only when the other procedures have proved ineffective.

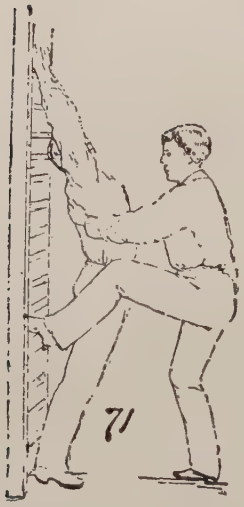
Reclin. T. vibr.—The patient is reclining with the trunk nearly horizontal. The operator stands on the patient's right side (or astride him), close to and facing him, grasps the patient under the back with the fingers of his two hands meeting just below the shoulder-

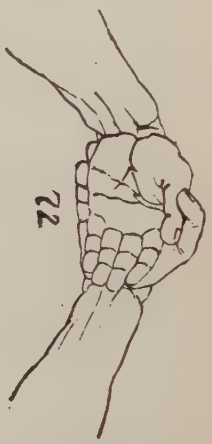
blades (fig. 70), and while gently arching the patient's spine by lifting with both arms, he vibrates the thorax with a fine tremulous motion reaching from spine to sternum. Gently he lets the patient down again, pauses a moment and repeats the procedure (including the pause) five to eight times. This movement resembles chest percussion (see page 83) in its effects, but

is far gentler, and therefore can be more easily endured by weak patients. It differs somewhat in mechanical effect, since in chest-percussion the waves move both from the sternum and from the spine, while here the direct waves go only from the spine, so that in T. vibr. it will be chiefly the posterior portions of the lungs that will become affected. On the other hand, in chest percussion the vibration produced is largely local, confined to the substratum of the stroke at the time of the concussion, while in T. vibr. the whole lung is vibrating at once, or at least in a succession and with a continuity more like those caused by respiration. So that T. vibr. has a greater effect of stimulating the respiratory act, while chest percussion is more a local application to individual air-cells. T. vibr. also produces a vibration in the heart and aorta, driving the blood onward into the arterial system, and hence is useful in organic heart-diseases, especially when heart percussion cannot be endured. In that way, while one movement may substitute the other, each has its own sphere of usefulness.

Str. gr. st. T. vibr.—The patient takes str. gr. st. pos. (fig. 71) at the stall-bars or other convenient apparatus. The operator stands facing him; braces one foot against the bars; and, with hands locked or overlapping (fig. 72) on the patient's back just below the shoulder-blades, he vibrates the patient's thorax, while drawing him for-

ward until his heels are off the floor. He lets him sink back and repeats the procedure six to ten times. The pressure by the hands in the back should have a forward upward direction, and should be slow and steady. The movement may conveniently be combined with respira-





tion, inhalation occurring while the body is being arched ; exhalation, while it recedes towards the apparatus. By the tension in the pectorals a strong thoracic aspiration is produced. The superior chest and the vascular capacity of the arms increase at the same time, so that

while a greater quantity of blood is passing into the thorax, yet there will be no undue increase of pressure in the heart and large vessels: the general circulation is hastened without increase of heart-beat. The chest expanding and the air cells filling, the vascular surface in the lungs increases; and as at the same time the air-cells (especially of the apices) and their capillaries are thrown into rapid vibrations, a more perfect osmosis will ensue: a more perfect exchange of gases takes place between the pulmonary air and the blood. The elasticity of the air cells will increase, partly owing to the molecular revulsion set up in their walls, partly owing to their more perfect expansion by the in-rushing air whose penetrating energy has become vastly increased by the vibration. The motion produced in the bronchi and their minute ramifications causes a diminution of their mucus secretion, or rather, causes reabsorption of superfluous or accumulated mucus (this is a known fact, whose theoretical reason has not yet been found). The movement then has a large field of utility: It may be applied for its general effects upon the circulation as a strong respiratory exercise of the passive type; as a means of providing better oxygenation of tissue in emaciated individuals, and in cases where the metabolism is not rapid enough to secure a proper assimilation of ingesta; in cases of pelvic congestion, where "internal elevation"

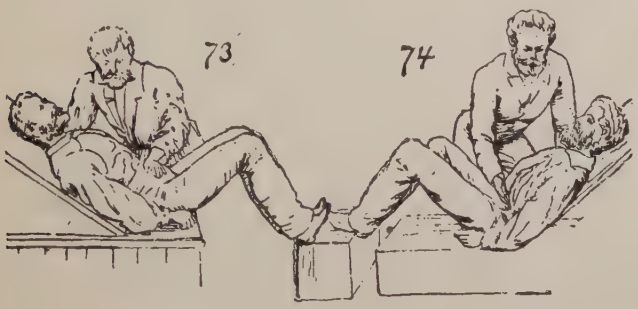
is indicated; in foreshortening of the thorax and abdomen, due to pectoral rigidity; and in cases of pulmonary disease located in air-cells or bronchial tubes.

This movement is not used as a substitute for chest percussion, but is often applied as a finish to it. It is contra-indicated in organic heart-diseases, owing to the effects of the commencing position: expansion of aorta and ventricles.

Sitt. Heart-Vibr.— Patient sitting (fig. 10). Operator stands on his right side, places his right hand in the middle of the patient's chest and his left in the middle of his back, the fingers of both hands pointing vertically down. Pressing his hands firmly towards each other he produces a tremor inward from spine and sternum. The pressure should be moderate and the vibration should have the shortest possible wave.—The movement, in its effects, resembles ulnar heart percussion (see above), but is milder and leaves no soreness in the superficial chest muscles. It is used in dilatation of the ventricles with atrophy of the walls.

Cr. Reclin. abdomen-vibr.— The patient reclines with knees drawn up and feet supported so as to relax the abdominal muscles. The operator stands to one side and applies his nearest hand across the patients abdomen, the hand being arched so as not to press on the umbilicus (fig. 73). Without sliding on the skin he gives a rapid

to-and-fro movement (like sawing) letting the pressure from the hand gradually change from the radial to the ulnar border and back again, so as not to give a continuous pressure on any one part of the abdomen. Inter-



spersed with brief pauses, the movement is continued for two or three minutes, the pauses being conveniently filled by gentle kneading. The movement superinduces peristalsis: It is a counter-irritant in diarrhœa.

Vibration of the abdomen is also given in the form of a gentle dorso-palmar tremor by one hand moving from place to place. In this form the vibration is an auxiliary to kneading, inducing peristalsis, and assisting in loosening hardened fæces, etc. It has also been found to afford great relief in flatulency and atonic dyspepsia.

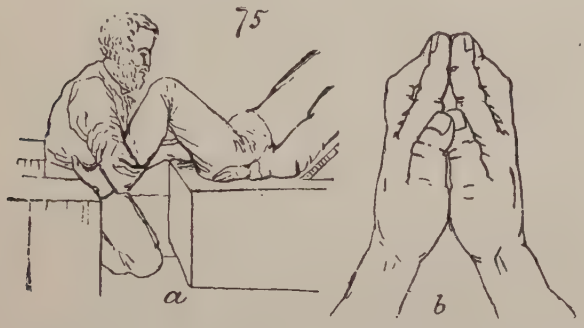
Colon-vibration.— Patient in sit-reclin. pos. (compare figs. 2 and 8); operator stands facing him, and slides his right hand along the descending colon (from

above downwards while vibrating it in a palmo-dorsal direction, the cushions of the fingers giving a slight pressure while gliding. A similar movement may be done upward on the right side, and also across the abdomen ; and the skilled operator may even begin in the right iliac fossa and follow the course of the colon to the sigmoid flexure with one continuous vibration. The movement is very useful in constipation and will prove even more efficacious than the kneading with the tips of the fingers.

Left Hypochondriac vibration.—Patient in cr. *a* reclin. pos., operator stands to one side and applies his hand edge-wise below the patient's left ribs (fig. 74). He rolls his fingers in under the ribs, and, pressing upward, he performs a tremulous vibration putting the stomach into motion. The movement may done with both hands, the operator standing on the patient's left side and slightly back of him. A molecular revulsion is set up in the gastric branches of the n. vagus, and in the gastric and peptic glands, causing a livelier secretion and inducing peristalsis. The movement has proved useful in atonic dyspepsia, in gastralgia, etc., and, when used, is best applied as a preliminary to kneading. Care should be taken not to press the fingers against the diaphragm (middle leaflet), as that may upset the heart's action. For quite the same reason the movement is contra-indicated in heart-diseases.

Sub-sternal vibration.—Position of patient and operator as in sub-sternal pressure (See page 72 ; fig. 55). The fingers of both hands give an inward, upward pressure (fig 56) combined with vibration. The effect is changed neurition in the pneumogastric, and the movement is indicated in flatulency, gastralgia, heart-burn, etc.

Bladder-vibration.—Position as in suprapubic pressure (page 72). The hands press inward upward while vibrating. The movement is indicated in chronic cystitis, and in paralysis of the sphincter.



Perineum-vibr.—The patient reclines with feet drawn up, separated and supported (fig. 75a. : cr. a stride reclin. pos.). The operator sits in front, presses the fingers of both hands (as in substernal pressure, fig 75b) between the descending rami of the pubes and performs a sag-

ittal vibration. The movement is alternated by kneading of the same region and by transverse percussion of the inside of the thigh. It has proved useful in enlargement of the prostrate, in prolapsus ani, and in lacerated perineum.

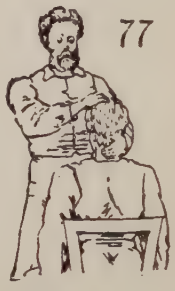
Head-vibr.—The patient sits erect; the operator stands in front and applies one hand on each side of the patient's head, the fingers just below the occiput, the heels on the cheeks, and the hands arched so as not to press on the ears. Lifting the head so as to make the neck tense (the lifting is done chiefly by the fingers), he puts it into gentle vibration; pauses a moment, while relaxing; vibrates again, etc.—All the blood-vessels of the brain are brought into motion: a temporary increase of cerebral pressure sets in, which is soon followed by its diminution, the vessels contracting (owing to vaso-motor reflex), and the blood being driven into the distended vessels of the neck—the jugulars and tributaries become stretched, *i. e.* distended, by the lifting of the head—so that the movement becomes a means of rapidly relieving congestion of the brain. It surpasses percussion in general effect on the brain and cerebral vessels, and may be given when percussion cannot be endured. No other movement affords such a sense of rest and recuperation in nervous headache and mental fatigue as a well applied vibration. On the other hand

the local effect on the cortex is greater from percussion, the vibration more especially affecting the ganglia at the base of the brain. Head-vibr. is usually applied as a finish to head percussion and head circ.

Ear-vibr.— The patient sits erect; the operator stands facing him and grasps his ears between the fingers and heels of the hands; and, while slightly pulling the ears upward outward, he produces a tremor which becomes transmitted into the ears—possibly reaching the tympanum and ossicles. The movement is recommended for deafness (Hartelius), but is of doubtful, or at least non-proven value.

Nose-vibr.—The patient takes stoop sitt. pos. (fig. 11). The operator stands on the patient's right side, applies his left hand between the patient's shoulders and with his right grasps the nasion (fig. 76) so that the middle phalanx of the index finger rests against the frontal bone, the third phalanx along the nose, and the thumb and middle finger against the sides of the nose (without pinching). While gently (but quite rapidly) pushing the patient into erect attitude, he vibrates with his right hand so that the tremor goes through the index finger into the frontal bone, the wave being sagittal instead of transverse. Then he pushes the patient forward into stoop pos. and repeats the procedure three or more times, the vibration occurring while the patient rises. The move-

ment causes absorption of mucus in the nasal passages and has proved useful in catarrh. The backward motion of the trunk causes an increase of blood-pressure in the head (by centrifugal force), and thus improves the effect of the vibration.



Larynx-vibr. The patient stands or sits. The operator stands to one side and applies his hand on the patient's larynx, the thumb on one side, the fingers on the other (grasp back of the cricoid cartilage and slide the hand forward to the middle of it. This will prevent gagging.); and without squeezing he gives a transverse vibration (tremor), his fingers touching the throat merely enough to communicate the motion. The movement is alternated by kneading. The effect is increased absorption and changed neurition, and the procedure has proved efficacious in catarrh of the throat, sore throat,

colds, paralysis of the vocal cords, etc.

A similar movement may be applied to the pharynx.

Jaw-vibr. The patient sits with open mouth: the operator stands in front and puts both hands under the patient's jaw, fingers crossing, thumbs resting on the canine teeth and the heels of the hands pressing against each other. The jaw is now given a minute upward-downward, or forward-backward vibration alternated with resistive closing of the mouth. The movement is useful in odontalgia, and in periarthritis of the temporo maxillary articulation.

Scalp-vibr. (Fig. 77.) The patient sits or reclines. The operator vibrates the scalp by a rapid to-and-fro movement of the fingers of one hand, only the cushions of the fingers being in contact with the head and pressed firmly against it so as not to glide on the hair. The movement is rectilinear from index-finger to little finger and back (it is not dorso-palmar). The hand is moved from place to place over the head so that all the scalp may be exercised, and the other hand meanwhile steadies the head for better localization of effect. The movement causes molecular revulsion in the hair-roots, etc., increasing the nutritive phenomena, and it has proved valuable in baldness, both as a preventive and a cure.

Face-vibr. The muscles and tissues of the face are vibrated by the fingers of one hand (as in scalp vibr.)

while the other hand steadies the head (or the head rests against the back of a chair, etc.). The movement is usually applied from the lobule of the ear radially toward the forehead, cheek, and jaw (following the ramifications of the facial nerve). It is used in facial paralysis, neuralgia, etc.

Vibration may be applied in connection with other passive movements, *i. e.*, extension and rotation, or with these two combined. This is done so that the operator steadies the proximal side of the articulation with one hand, grasps the limb with the other hand near the next joint, and gives a vibration while extending or rotating the limb at the fixed articulation. This procedure is especially useful for stiff joints after fracture, dislocation, sprain; in arthritis, periarthritis, etc.

It loosens adhesions, stretches contracted tendons, and replaces interarticular cartilages into juxta–position more quickly than any other procedure. It is an invaluable adjunct to massage in traumatic cases.

Vibration is a most tiresome operation for the masseur, and to save his work numerous machines have been invented to substitute the hand. Of these. Dr. G.

Zander's machines for general vibrations, and Dir. H. Liedbeck's "Vibrator" for local applications are the best.

It should be said for the machine-vibration, that it can be given for any length of time with the highest degree of exactness; and that for this reason it is superior to the manual procedure, where vibration has to be used extensively as a special application. For ordinary purposes, however, the manual vibration is sufficiently exact.

Vibration imitates the most nearly the bioplastic movements, and in that manner becomes the most natural procedure. In the technique of massage, it forms one of the "finishing touches," and the wonderful success of some operators in delicate cases is oftentimes due to their skill in the use of vibration. We recommend the movement as one of the jewels of medical gymnastics.

Active movements.—

Synopsis:

- ACTIVE MOVEMENTS.
  - Mechanics
    - Kinds
      - Single — concentric.
      - Assistive — concentric.
      - Resistive — excentric.
    - Single: as educational gymnastics.
    - Assistive: operator helps.
    - Resistive:
      - Begin and end gently.
      - Smooth and even.
      - Power according to patient.
  - Effects
    - General
      - Increase cerebration.
      - " coordination.
      - " voluntary control.
      - " increase motor irritability.
      - Lessen sensory irritability.
      - Increase heart-beat.
      - " blood-pressure.
      - " metabolism.
      - Harden fibrous tissue.
      - Lessen adipose tissue.
    - Local
      - Increase afflux.
      - " nutrition.
      - " neurition.
      - " muscular sense.
  - Uses
    - General
      - Increase arterial circulation.
      - " nutritive activity.
      - " cerebro-motor activity.
    - Local
      - Increase absorption and nutrition.
      - Cultivate motor neurition.
      - Increase muscular contractility.
      - Restore absent movements.

A movement is active when executed by the patient himself; if he does it alone it is called single; if the

operator helps him in performing it, it becomes assistive; if one, or the other, or a machine offers resistance, resistive. If the action is that of giving up to the weight (as when a patient resists the stretching of his limb by the operator), the movement is called excentric, *i. e.*, the active muscle lengthens; if the action is that of overcoming the weight (or resistance), it is called concentric, *i. e.*, the active muscle shortens. These movements are so related in progression that the assistive precede the others for reasons plain to every one; and for a majority of cases the resistive precede the single, for the reason that in resistive movements the launching effort is partly reflex, caused by the contact of the apparatus or the operator's hand; so that the single movement really requires greater cerebral impulse—is more difficult from a neurological point of view.

The single movements are all borrowed from educational gymnastics and will need no description here, since every masseur should be familiar with that branch before entering the domain of medical gymnastics. Likewise, assistive movements will need no description, suffice it to say that these substitute the others when the voluntary nerve-impulse is deficient and has to be gradually restored. The resistive movements form the chief bulk of medical gymnastics, and their most common types will be described below. To take up all would be im-

possible since there are thousands of commencing positions, and there are many useful movements possible in any one of them. Before going into details it might be well to mention some general facts about active exercises.

Active* movements begin and end in the brain, so that their first effect will be increase of mental activity with consequent greater afflux to the active centres. The constant use of motor nerves will increase the irritability of these and it will be found that sensory nerves meanwhile become less impressionable. For that reason, active movements are most decidedly indicated for "nervous" invalids who are not weak enough for massage, —N. B. No one is too *weak* for massage, even though we often hear it said, "Oh, he is not yet strong enough for massage."—and whose neurasthenia is not of spinal origin. Active movements presuppose attention, will, and co-ordination, and consequently develop these, while passive movements favor inattention, relaxation. Active exercises also produce a consciousness of power, that *ability to do* (the aggregate of muscular sense), which in so many cases is a long step toward a cure, and which cannot be gotten by purely passive movements. While this holds good as a general effect, it is equally true that similar effects can be produced locally, *i. e.*, increased motor connection and heightened muscular sense in any

*In this treatise we do not deal with reflex and automatic movements as these have no place in gymnastics.

part will set in by localizing the exercises to that part.

Active movements increase the heart-beat by increasing the arterial resistance; secondarily, the arterial currents are hastened, their *vis-a-tergo* being increased. The general nutritive activity is heightened, since nutritive material is carried more quickly to the tissues, also because the increased pressure causes increase of osmotic phenomena. Assimilation and elimination increase so that the general metabolism is much heightened, raising the standard of general bodily health and strength.

Locally active movements cause an increased afflux to the parts put into motion, and there will be a consequent increase of local nutritive activity: growth of muscle and bone is encouraged, and even the fibrils of the active nerve increase in number and size. The active movements, then, become a means of developing under-sized, atrophied, and paretic muscles, and of bringing them under control of the will, in this respect far surpassing the passive movements, since these do not increase muscular contractility or motor neurition. It might be said that passive movements stimulate the vegetative functions while the active ones promote the animal ones—develop in the individual the active power of being, *i. e.*, of doing. The passive movements merely produce and maintain the power of existing, and so are in reality mere stepping-stones to higher ends, a means

of tiding the weakling over, and preparing him for a more normal type of activity.

Active movements, then, must be the final aim in medical gymnastics; and massage is to be considered merely as an introductory measure, and as an auxiliary, when the subject is considered as whole. This, of course, does not lessen the merit of massage as a specific application in a great many diseases, where in the nature of things active movements would be contra-indicated.

Of the comparative effects of active exercises it might be said that those of single movements are the same as of educational gymnastics; that resistive movements have these effects in a higher degree more localized, less generalized, especially as regards the action of the brain as a unit; and that assistive movements form a transition from the passive exercises to the active, having effects stronger than the first (effects of a different neural type) and very much milder than the last.

Active medico-gymnastic movements have as many uses as educational gymnastics and many more, since they are chosen for educational effects of a much more delicate nature: to lift the individual from a state of ill-health into normal power, to lead tissue-action into normal paths, normal habits, not only as in educational gymnastics, to encourage and increase the good health already present. To elaborate on the details of their

uses will not be necessary, the preceding synopsis furnishing sufficient information on this point.

As will be seen later, the choice, progression and interarrangement of medico-gymnastic exercises are based on pathological considerations rather than as the educational on physiological ones; yet through the realm of medical gymnastics there should be a strong influence of educational principle to guide and restrain the operator: he should remember that a patient is not merely an "interesting case" for study and experiment, but an individual with just claims to a place of his own in the world and with work of his own to do, and that medical gymnastics exists only as a means to help the patient reach the fulness of his power more quickly, and not as means of enjoyment to the masseur.—We have thought this advice timely, since many masseurs act as if they held the opposite view.

The resistive movements are usually done so that the patient executes the movement while the operator resists, but may in special cases be reversed, the patient offering resistance (giving up to the power) to the operator's movement. This form can be used earlier than the first-named one, and is especially useful in cases of motor paralysis, where the voluntary power is just returning. In the movements described below, the patient executes, the operator resists, unless otherwise ordered.

To indicate the reverse the abbreviation exc. (excentric) is added to the name of the movement.

The resistance offered should be slight at the beginning and end of the movement, since the muscles have the poorest levers at these points. Toward the middle of the movement the lever grows longer, and the resistance should increase proportionately. It is customary also to begin and end each movement with passive extension (or compression), it being found that a muscle contracts more readily, if it is stretched first. This is due to the fact that the recoil then assists the contraction, so that, in reality, the beginning of the latter is passive. Besides, passive extension has the effect of hastening the venous current, and in that manner, the fatigue products being carried away more quickly, the endurance in the muscle increases, *i. e.*, the resistive movement so prepared will give all the beneficial results and hardly any of the effects of fatigue. The muscles may also be prepared for contraction by massage, since this has been found to more than double their power of endurance. In any case the resistance offered should be modified according to the patient's strength, so that the movement becomes smooth, even, and free from tremor, pushes, or starts. The grasp should be light and easy, so as not to pinch or squeeze the patient, and yet it should be firm and steady.

The active movements can be classified like those of educational gymnastics into arch-flexions, lateral trunk-movements, etc.,—it is a fact that the Swedish "bill of fare" of exercises was used first in medical gymnastics—but for convenience of description in the following syllabus they will be grouped by names. There is, however, one group of exercises, the respiratory, which needs to be considered by itself, and for that reason we will describe it before the others.

Respiratory Exercises : —

SYNOPSIS :

- Respiratory Exercises.
  - Kinds :
    - Assistive.
    - Single.
    - Resistive.
  - Mechanics :
    - Respiration plus special chest-expansion.
  - Species :
    - wg. / rest } sitt. shoulder circ.
    - reclin. 2 A elev.
    - Str. reclin. 2 A flex.
    - reach ly 2 A elev.
    - wg. st. 2 Heel elev. w. chest exp.
    - Str. gr. st. chest exp.
    - St. 2 A elev. w. chest perc.
  - Effects :
    - Thoracic aspiration.
    - Quickened { venous / lymphatic } circulation.
    - Diminished blood-pressure.
    - Diminished right ventricular systole.
    - Increased oxygenation of the blood.
    - Increased elimination.
  - Uses :
    - For general effects on venous circul. } at { end / beginning / middle } of treatment.
    - For special effects on { *a*, portal circulation. / *b*, heart-beat. / *c*, aircells. }

The respiratory exercises consist in deep respiration accompanied by some movement that will emphasize the expansion and relaxation of the chest. The movement may be done by the patient himself, as in the ordinary respiratory exercises borrowed from educational gymnastics; or an operator expands the patient's chest, as in the assistive resp. exer., the common type used in medical gymnastics; or the operator may expand the patient's chest under resistance, the patient meanwhile making the effort of inhalation, a type used for muscularly strong patients who need an exaggeration of the effects of thoracic aspiration and internal elevation.

As the chest expands for inhalation, viscera become drawn toward the chest, and the blood is drawn forward in the venæ cavæ; also, the vascular surface in the lungs increasing, the blood is drawn from the right heart toward the vesicular capillaries. A general diminution of the pressure in the veins ensues, and the contraction of the right ventricle lessens, the blood passing onward mechanically as if affected by a force pump, the expansion of the chest representing the rising of the piston. At exhalation the reverse phenomena occur, there being a retardation of the venous currents and a slight acceleration of the arterial ones. By making the inhalation comparatively rapid, its effects may be heightened; and by making the exhalation slow, its effect of retardation

can be reduced to a minimum; so that the total effect of the respiratory movement will be diminution of blood-pressure and acceleration of the venous circulation. By making the chest-expansion assistive the negative pressure (suction) in the vena cava becomes five to six times as great as it is during ordinary respiration*; and it follows that the other effects of the movement are proportionately increased, making the movement of the greatest value in all disorders dependent on or accompanied by retarded venous circulation. The suction in the inf. vena cava will especially empty the hepatic veins, which are its nearest afferent vessels, and consequently hasten the flow through the liver, so that the respiratory exercises become very useful in cases of sluggish portal circulation.

The diaphragm being brought forcibly into play, and viscera becoming alternately drawn toward the chest and allowed to descend, these movements tend to induce peristalsis, and especially to favor intestinal elimination, much after the fashion of abdominal massage described above. It should be said, however, that the respiratory exercises are of more value than the local massage in all disorders of digestion that cannot be called strictly local disturbances, and that they will accomplish much more

*According to Dr. Wundt's experiments this negative pressure is ordinarily 7.5 m. m., while during the assistive respiratory exercises it rises to 35 or 40 m.m.

owing to their general effects.

The respiratory exercises are useful in cases of malnutrition, since the tidal volume of air becomes increased and a better oxygenation of the blood ensues. They are also useful when the air-cells need special exercising to overcome those conditions which favor phthisis, etc., and for that reason are indicated in lung diseases, when there is no acute pulmonary congestion.

Respiratory exercises are usually applied at the end of every medico-gymnastic treatment for quite the same reasons as in educational gymnastics; and similarly they may be applied as an introduction to the treatment. Besides they may be given after every two or three other procedures as a special application for the individual case in hand. And it might be said that in all materia gymnastica these exercises head the list for efficacy and general utility.

Before entering upon the description of the special exercises, we would remind the operator that the movements should follow the rhythm of the patients' respiration; that the exhalation should always be very slow, while the inhalation may be somewhat quickened; that the pause in the respiratory act occurs after the exhalation, and that this should be observed in applying the movement; and, finally, that too much repetition, too long duration of respiratory exercises will make the patient dizzy owing to the increased efflux in the head.

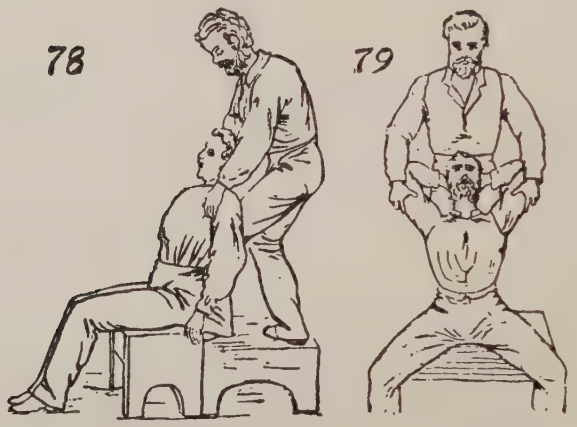
Wg. sitt. 2 should. circ. w. resp. (Fig. 78.) The patient sits on a stool, or a massage bench, etc. The operator stands behind, supports the patient's back with one knee (the contact should be by the external aspect of the leg), and grasps the patient under the axillæ, the hands resting gently against the anterior aspects of the shoulder-joints. The hands should reach under so far as not to allow the finger-tips to press or slide in the axillæ. The operator now tells the patient to breathe in and out in a normal manner; and, falling into the patient's rhythm of respiration, he lifts the shoulders upward backward while arching his thorax over the supporting knee, and lets them sink downward forward while moving the trunk somewhat forward, the lifting taking place during inhalation, the lowering during exhalation, so that the movement becomes an emphasizing of the patient's own effort. Care should be taken not to compress the patient's chest and push his head forward during the exhalation, but to make this merely an easy and natural relaxation. The lifting should be done so as to become communicated throughout the chest; the touch of the hand should be firm but gentle; and the support from the leg should not be a pressing of the knee into the spine.

The movement can also be given so that the operator sits behind and close to the patient supporting the lat-

ter's thorax with his own and grasping the axillæ from behind and underneath, the hands turned edgewise, radial borders up, the fingers resting gently on the chest in front, care being taken not to press the finger-tips into the pectorals. This manner of doing the movement is more agreeable to the patient, who becomes better supported, and to the operator who now works in an easier position. If the patient sits on a high couch, the operator stands behind, and uses this same grasp, the conditions of support and ease of movement becoming the same as when he is sitting behind. The type first described, although the one most commonly used by masseurs in general, is really to be considered as a poor substitute for either of the last two.

The movement produces an increased respiration (with consequent results as described above), especially in the anterior superior portion of the lungs, and so becomes particularly useful in cases of weak pectorals and sunken clavicular region. Whenever a respiratory exercise is needed for its general effects this is the movement usually applied, for it is more comfortable to the patient and is more easily given than any of the others; besides, it has very few special effects of internal elevation or other changes of visceral inter-relations worth considering. The preference of this movement to str. ly. 2 A.

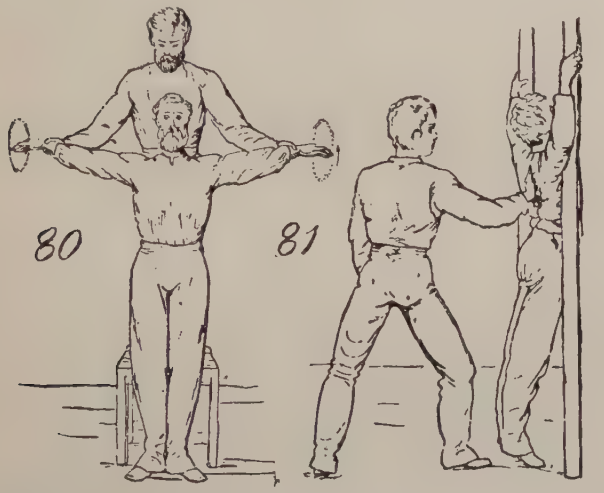
elev. in retroversion, and its contra-indication in anteversion will be discussed in Part II.



Rest sitt. 2 should. circ. w. resp. (Fig. 79.) The operator stands behind the patient and grasps the latter's arms near the shoulders, his forearms resting over the patient's elbows; in other respects the movement resembles the one just described. The expansion of the chest is greater, the tension in the pectorals being stronger, and the base of the lungs is brought more into play owing to the greater motion of the shoulder blade and consequent play of the serratus magnus. In comparison to the preceding exercise there is some diminu-

tion of apicial respiration, the upward-backward motion slightly compressing the clavicular region ; on the other hand the efflux from the head is greater owing to the position of the axillary artery. The movement, besides being used for its own special effects, may be applied as a progression from the preceding one.

Yd. c 2 A. circ. w. resp. (Fig. 80.) The patient stands or sits. The operator stands behind, grasps the patient's



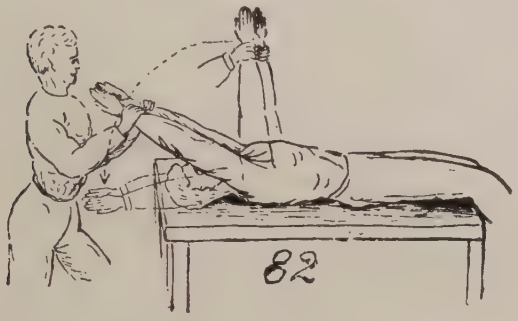
arms near the elbows, lifts them sideways to horizontal and moves them in small circles upward-backward, downward-forward, while the patient inhales and exhales. The movement (which is used comparatively little) pro-

duces an increase of activity in the anterior portion of the lungs ("sternal respiration"), and is used chiefly for patients not quite strong enough for single movements.

Reclin. 2 A. elev. w. resp. The patient is lying down with slightly elevated trunk. The operator stands facing the patient, grasps the latter's arms around the wrists, lifts them forward upward while the patient inhales, and lowers them sideways downward while the patient exhales; he then crosses the patient's hands and presses them gently into the epigastrium so as to exaggerate the exhalation. The patient's arms should be relaxed throughout the movement, and consequently the elbows are always flexed except at the moment when the arms attain str. pos. Take care not to squeeze the patient's wrists.— This movement is used for bed-ridden patients who cannot sit up long enough to take the 2 should. circ.

Reach. ly. 2 A elev. w. resp. (Fig. 82). The patient is in sitt. ly. pos. The operator stands behind, grasps the patient's wrists and lifts his arms to vertical (reach. pos). From that position he draws the patient's arms backward to str. pos., taking care to lift the arms well, so that he, and not the patient, carries them. The arms are brought back to reach. pos. and the movement is repeated, inhalation accompanying the first motion, exhalation the second. As the arms are drawn back a

strong tension occurrs in the chest, which becomes vaulted sagittally and lifted longitudinally ; the abdomen flattens and its contents become drawn toward the chest. So that the movement produces a high degree of internal elevation (= thoracic aspiration plus muscular



pressure) with a tilting backward of viscera. As a respiratory exercise the movement is far more effective than the 2 should. circ. ; and it is especially useful in disorders accompanied by abdominal or pelvic congestion. It is contra-indicated in retroversion, and in lordosis. In the last-named deformity the movement can be used if the legs are first drawn up into 2 cr. *a.* pos. (see fig. 7, page 9), as this will obliterate the effect of tension in the ilio-lumbar fascia. The movement is very useful as a means of lengthening contracted pectorals, and is often applied for this purpose in educational gymnastics to

chest-bound individuals, who are not sufficiently affected by the ordinary exercises of chest-expansion.

The movement can be made resistive; and so become more efficacious as an exercise for internal elevation: the patient resists the drawing back of his arms, the return being passive. The pectorals now being active, the expansion of the chest becomes so much more forcible. It is to be understood that the resistive type is used only for muscularly strong patients, and in special cases, and that it is not applied as commonly as 2 should. circ. and others of this group.

Str. gr. st. chest expansion. (Fig. 71, page 104.) The patient stands with his back to the stall-bars, arms extended upward and grasping the highest bar within reach. The movement is executed like the str. gr. st. T. vibr. (page 103), the patient inhaling as he is being pulled forward, and exhaling as he returns to commencing position. The movement can be done as well at the hor. bar., in a doorway, between two vertical poles (fig. 87), etc., etc. — The movement is especially useful in disorders of the respiratory organs, although it may also be used for its general effects.

Str. sitt. 2 A. flex. w. resp. The commencing position of patient and operator is as for str. sitt. 2 A. circ. (Fig. 47, page 54.) The patient draws his arms down to bend pos. (fig. 40. 2) while the operator offers a moderate

resistance, the return to str. pos. being passive on the part of the patient. During the flexion the operator should guide the patient's arms so that the elbows do not come forward. The patient inhales while he flexes his arms, exhales while the operator extends them. The exercise emphasizes apical respiration and widens the chest transversely, and so is especially useful for patients of phthisical habitus. The movement may also be given from reclining and lying pos. and will then produce more effect on viscera, the tension in the anterior muscles reaching the farther down the more the hip-joint straightens.

Wg. st. Heel elev. w. chest exp. The patient stands with his hands on his hips (fig. 24). The operator stands behind and grasps the patient's arms (the hands resting on the anterior aspect), tells him to rise on tip-toe and inhale, and meanwhile presses the arms gently backward (the pressure is tentative and vibratory), taking care not to press the elbows up or down, but straight backward. The patient is told to lower his heels and exhale and meanwhile the operator removes the pressure. The movement is used chiefly as a corrective exercise for flat-chested, chest-bound, and round-shouldered children — as an exercise for muscular extension rather than one for respiratory effects.

St. 2 A. elev. sidew. w. chest perc. The patient lifts his

arms sideways to horizontal while inhaling, and meanwhile the operator applies a gentle chest percussion as previously described (see page 83). By adding the percussion to the respiratory act, the air becomes driven into air-cells which may otherwise remain inactive; and hardened, inelastic cell walls may become distended and restored to normal condition. Besides the percussion favors absorption of mucus in the bronchioles and so helps to remove impediments to the free passage of the air. The movement is used in bronchitis, incipient consumption, etc., i. e., whenever the respiratory exercise is especially intended to affect the lung tissue itself. As a respiratory exercise for general effects it would be practically valueless.

Resistive movements. In addition to what has already been said about resistive movements it should be mentioned that the resistance should always be applied at right angles to its lever (so that the lever of the weight does not change during the movement), as this gives a steadier movement, one more comfortable to the patient. The only change in the resistance should be one of pressure (weight), which is made to increase as the lever of the power grows (toward the middle of the movement) and to decrease as the lever shortens (at the beginning and end of the movt.). The resistance throughout should be so moderated as to give a movement of uni-

form velocity — slow rather than quick — and motions done in pushes and starts, or with so much resistance as to cause vibration should be discouraged, as neither is in accordance with the laws of normal muscular contraction and produce undesirable effects on muscle-fibre and motor nerve, they usually being types of overwork. Moderate the resistance carefully according to the patient's strength, and remember that medical gymnastics is not combative exercise (wrestling), but that even a slight resistance is enough to increase the muscular activity with consequent effects over that of ordinary everyday life or of single movements. The purpose is to get some exaggeration in the effect of the active movement, not to find how "strong" the patient is. In scoliosis and similar disorders, on the other hand, the resistance is often driven to the patient's utmost power (= his nervous capacity inside the limits of normal fatigue), since it is then a question of getting the utmost pressure for displacement of bone, cartilage, etc.

When taking hold of the patient, do not pinch or squeeze; and while one hand gives the resistance, steady the next articulation with the other hand, so as to get the greatest fixation of muscular origin and so gain the best isolation of movement and localization of effect. It is to be understood that isolation has also been provided by a correct choice of position and direction of motion:

the axis of motion should be at right angles to the median of that muscle which is to be the most active. A total isolation is impossible; but those synergists contribute the least to the movement whose medians deviate the most from the 90° angle.

Flexions and Extensions: —

Sitt. neck ext. The patient sits with his hands on his knees and his head bent forward. The operator stands behind, places one hand on the patient's shoulder, the other against his occiput, and with this hand he offers resistance against the patient's effort of flexing the neck backward. The patient again bends his head forward (without resistance) and the movement is repeated three or more times. If the movement is given for circulatory effects, the head should bend backward with upturned face (to stretch the cervical fascia); if for muscular effects, correction of posture, etc., the chin should be drawn in (so as to lift the sternum). The movement is used to increase the afflux to the head; to increase the nutrition of the brain; to relieve that cervico-dorsal fatigue which results from prolonged work in a stooping posture; to correct the posture of chest, head and dorsal spine in flat-chested, stoop-shouldered individuals; and to exercise the trapezius, complexus, levator scapulæ, etc., in cases of rheumatism, torticollis, and cervical neuralgia, etc. In such cases, for unilateral muscular action, the

head is rotated more or less before bending, in order to bring about the proper condition of isolation (details which belong in kinetic anatomy, and are supposed to be familiar to the skilled masseur).

83

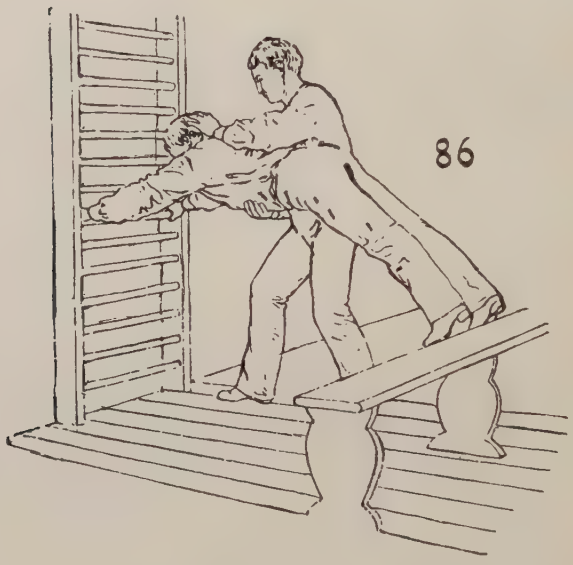
85

84

The movement may also be done from st. pos. (fig. 83), reach gr. st. (compare fig. 68, page 88), stoop fall. (fig. 86), wg. forw. ly. (compare fig. 6, pp. 8), and balance hang. (fig. 87 and 88), the mechanics of which hardly need description.

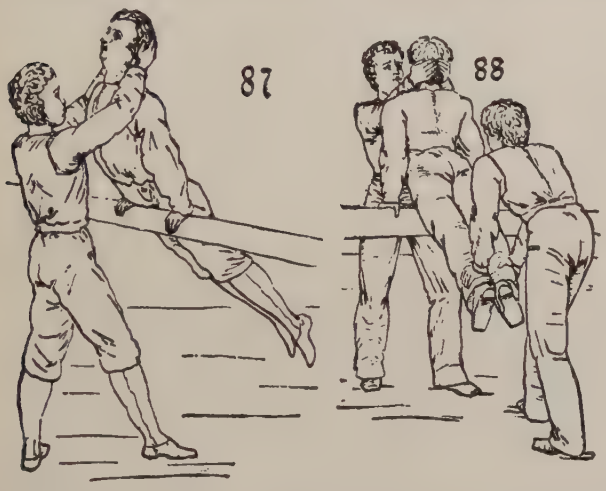
The st. pos. lessens the motor neurition to the neck, part of the volition being spent in retaining the equili-

brium, and consequently the degree of exertion becomes greater than in sitt. pos. Also the hip-joint being straight, and the lumbar spine being somewhat arched



forward, the ilio-lumbar fascia is relaxed, and so the inferior muscular origin does not have the same degree of fixation nor of distance from the insertion as in sitt. pos., which circumstance contributes to making the necessary muscular effort greater.

The positions with inclined trunk (forw. ly., stoopfall etc.) make the deep neck muscles perform the extension, the trapezius being occupied in retaining the position



consequently they are used as means of changing the localization of effect. Besides they are used for purposes of emphasizing the correction of a stooping posture, the effort extending farther down the back than in sitt. pos.

Sitt. neck sidew. ext. The patient is sitting with his hands on his knees. The operator stands behind, and placing his left hand on the patient's left shoulder, the right against the right side of the latter's head (just

above the ear), he pushes the head gently and (passively) to the left as far as it will go. The patient now straightens his neck and bends it as far to the right as muscular tension will permit, the operator offering a moderate resistance and holding down the patient's left shoulder with the corresponding hand. The operator then changes grasp, letting his right hand drop to the patient's right shoulder, and placing his left against the left side of the patient's head, and the movement takes place to the opposite side. It is repeated three or more times, alternately to each side, the operator changing grasp each time. The movement brings into play the scaleni, and may be used as a means of lifting the first two ribs in order to secure better inspiratory power. It is also used in muscular rheumatism of the neck, in cervico-brachial neuralgia, in torticollis (then only to one side), and as a means of increasing the afflux to the brain.

By slightly rotating the head before flexing, a change of muscular isolation may be affected, so that one scalenus becomes more active than the others, etc.

Reclin. F. flex. and ext. (Fig. 89 and 90.) The patient reclines, the operator sits to one side with the patient's leg across his lap, the heel fully outside his thigh. With one hand (the proximal one=left for right side, right for left) he grasps the leg near the ankle, and with the

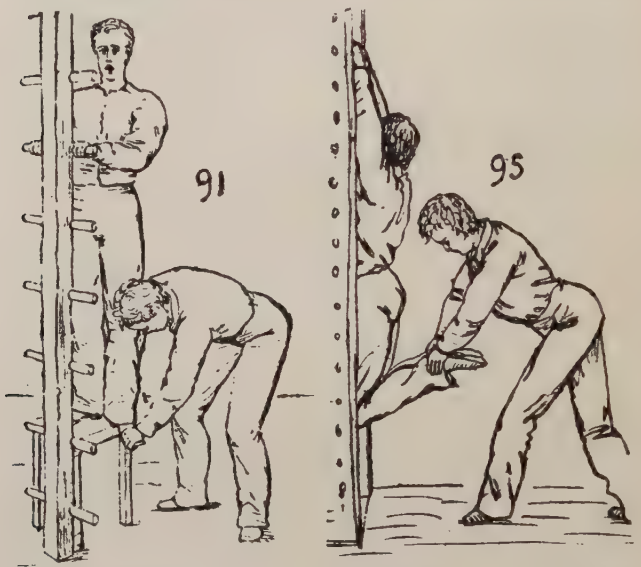
other he resists the flexion and extension of the ankle, the heel of his hand pressing against the ball of the foot during extension (fig. 89.), the palm against the upper surface of the metatarso-phalangeal articulations during flexion (fig. 90). The movement is repeated a

number of times, the grasp of the resisting hand changing as the movement changes, and it is usually ended by passive foot flexion (=pressing the foot up as far as the resistance in the hamstrings will permit).

The movement is used to increase the afflux to the leg, and to exercise weakened muscles in rheumatism, paresis, traumatism, etc. It is to be understood that resistance is made only to flexion in case of weak flexors, and only to extension when the extensors are to be exercised.

High 1-2 *st. F.flex.and ext.* (Fig.91.) The patient stands on a chair, his hands supported against a wall or bar,

etc., and one foot resting over the edge of the chair (the heel on the chair, the toes hanging over). The operator grasps this foot with one hand behind the



heel for support, the other resisting on the dorsal and plantar aspects, as the patient flexes and extends his ankle. The activity of the position is greater than in the preceding movement, so that the degree of motor effort is greater. Also, the straightening of the hip-joint insures a greater afflux and a less muscular isolation, the effort extending into the glutei and psoas-iliacus.

The movement is used as a progression from the preceding ones, and as a unilateral exercise in scoliosis, infantile paralysis, etc.

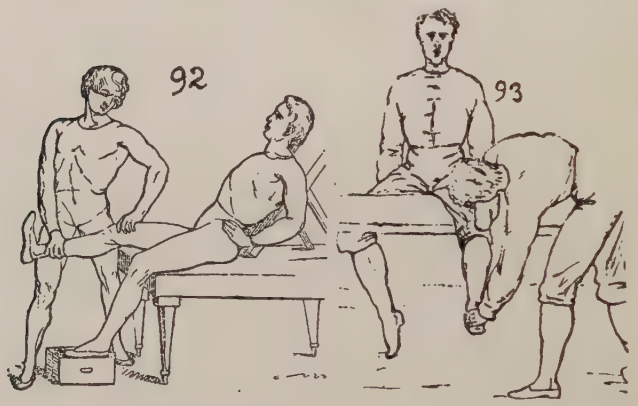
Hang. F. flex. and ext. The patient hangs from a bar or other apparatus, the operator stands behind and resists the flexion and extension of the ankles, with one hand for each foot. The movement may be done symmetrically or unilaterally, in the former case as a means of emphasizing the stretching of the spine by adding weight, in the latter case to depress a high hip (scoliosis), or to cause local increase of nutrition in an atrophied leg, etc.

In its effects on the circulation the movement is stronger than the preceding two, but in point of muscular localization it is not as strong.

Passive F. flex. The patient reclines with his leg across the operator's lap. The operator grasps as for res. F. flex. ext. (fig. 90), and presses the patient's foot upward as far as muscular resistance will permit. The movement is usually combined with vibration. It is used as a means of stretching shortened hamstrings; to increase the mobility of the ankle; and to secure better efflux in the leg (by expansion of posterior capillaries).

Reclin. Kn. flex. and ext. (Fig. 92.) The patient reclines, the operator sits to one side with the patient's nearer thigh resting over his own. His proximal hand

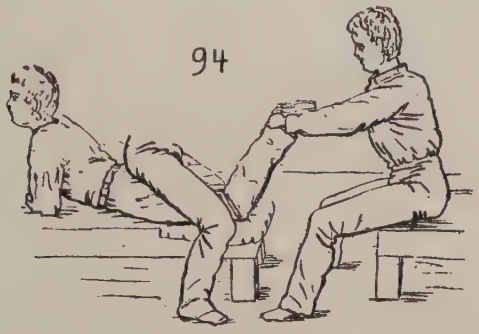
rests over the patient's thigh just above the knee (so as to prevent the thigh from rising during the flexion); and, grasping the leg just above the ankle with his distal hand, alternately over and under, he resists the extension and flexion of the knee. Remember never to make the extension excentric, *i. e.*, not to press the leg down under resistance from the patient, as this has repeatedly caused synovitis by distension of the capsule (due to excessive contraction of the subcrureus).



The movement is used for local exercise of the thigh-muscles, and as a powerful means of increasing the afflux (the nutritive activity) in the leg as a whole. It is very suitable in disorders of digestion due to abdominal or pelvic congestion.

1-2 *Sitt. Kn. flex. and ext.* (Fig. 93.) The patient stands with one thigh supported over a bar (or other apparatus, compare fig. 14). The operator stands to one side and uses the same grasp as for the movement just described, the execution also being the same.

The movement is stronger than the preceding one both as regards muscular effort and circulatory effect, and it is used as a progression from that one.



Prone ly. Kn. flex. and ext. (Fig. 94.) The patient lies face down on a couch. The operator sits behind, grasps the patient's legs just above the heels and resists the flexion of the knees, then moves his hands to the anterior aspect of the legs and resists the extension. (The flexion is driven passively to the involuntary limit after the voluntary limit has been reached.) The patient's thighs may be held down (for better localization) by an

assistant (as shown in the cut) or by a strap.

The flexion is used to exercise the hamstrings and is then often given unilaterally and from 90 ° with rotation inward or outward, according to which hamstring is to be the most active. The double movement (flex. and ext.) is used to increase the afflux to the leg for the purpose of diminishing spinal congestion, the position favoring the return current from the spine.

Hang 2 Kn. flex. and ext. (Fig. 95.) The patient hangs from the stall-bars, facing them. The operator stands behind; grasp and movement as just described. The cut shows the excentric flexion, the hands being turned out (in prone ly. 2 kn. flex. they are turned in), and the operator pressing the legs down under resistance from the patient. This is the most common form of the movement in that position. Not only the hamstrings, but also the glutei and erector spinæ, etc., are now brought into play, and the movement becomes a means of strengthening a weak sacro-dorsal region for better equilibrium in standing and walking. [It should be remembered that, while the glutei do not determine the equilibrium of st. pos., they are the chief muscles for the pendulum motion of the legs in walking, and their atrophy or paralyzation means a loss of the power and coordination of this movemont, if not its total disappearance. On the other hand, the erector spinæ determines

the equilibrium of the trunk in st. pos., and this movement furnishes an excellent means of exercising and strengthening its most inferior portion *in its relation* (synergy) *to movements of the leg*].

The movement has given good results in polyomyelitis; in akinesia after fevers; in educational gymnastics for the correction of posture, etc., etc.

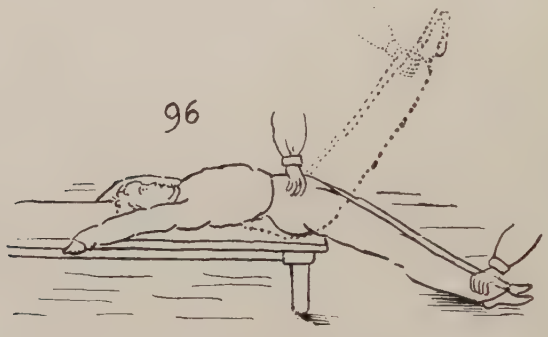
[Before entering upon the details of hip-flex. etc., we take occasion to remind the operator a little of the action of the abdominal muscles.

These muscles may be classed into two groups—one vertical, one horizontal. The first embraces the ext. oblique, quadr. lumborum, rectus abdom., psoas, and iliacus; the last includes the transversalis, and the int. oblique. The horizontal group is active in transverse movements; the vertical group in sagittal movements. Synergists to the former are the internal intercostals; to the latter, the ext. intercostals, the serratus magnus, and the pectorals.

The muscles surround the abdominal cavity by two spiral layers nearly at right angles to each other and one transverse layer (compare the heart), their simultaneous contraction causing a diminution of the cavity in its three dimensions.

Owing to the lineæ transversæ, the rectus contracts vermicularly: and, depending on which end is the origin (the fixed point) at the time, the muscles may contract from above downward, or from below upward, causing a corresponding compression of viscera. They may contract from bony insertion, or from tendinous insertion (ilio-lumbar fascia, lineæ transversæ, alba, and semicircularis, and Poupart's lig.), or with viscera as the fixed point. Finally they may contract from behind forward, or from before backward. They are brought into play in hip flex. proportionately as the moment of weight grows.]

Str. gr. ly. 2 L. flex.—The patient is lying face up on a bench or couch grasping its sides, his arms being extended upward. The operator stands facing the patient, grasps his legs just above the heels, and offers a moderate resistance while the patient draws his feet up (flexing at hips and knees). The heels should be kept together, and the knees spread apart as they flex. When the voluntary limit is reached, the operator presses the patient's knees as far up as gluteal resistance will



permit, and brings the legs passively back into commencing position. The movement is repeated from three to nine times. The psoas-iliaci and external obliques are brought into play, compressing the abdominal cavity from below upward, and driving its contents toward the highly expanded chest. The movement relieves pelvic hyperæmia and causes a lifting of viscera. Being an active

movement—a movement of nutrition—it becomes exceptionally useful in those pelvic disorders, where a general visceral depression has resulted from prolonged congestion with consequent malnutrition of supporting bands, ligaments, and muscles. It is also useful in cases of pelvic fatigue (without uterine complications) resulting from prolonged standing position (clerks, salesmen, artisans, etc.) It is contra-indicated in retroversion.

Str. gr. ly. 2 Hip flex.— (Fig.96). The patient is lying down as in the preceding movement. The operator stands at his side, places one hand on his abdomen, the other on his ankles and offers a slight resistance while the patient slowly lifts his legs to nearly vertical. The hand which rests on the abdomen gives a gentle pressure inward upward. Still pressing on the abdomen, the operator pushes the patient's legs down, while the patient offers a slight resistance; and the movement is repeated two or more times. The patient must not hold his breath while doing the movement. The movement is usually applied with resistance only going up, or only coming down, the return to commencing position being passive.

The concentric movement (the going up) produces a compression of viscera from below, backward upward; has effects similiar to the preceding movement; and is used for the same purposes, but is much stronger.

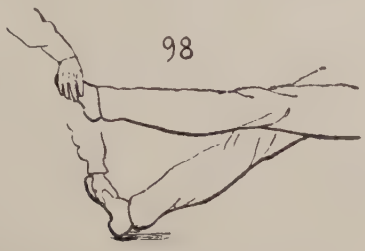
The excentric movement (the pushing down) produces a downward pressure on the contents of the intestines (thanks to the expansion of the chest, viscera are not depressed), and so becomes useful in obstinate cases of constipation, intestinal indigestion, etc. Both movements are excellent to reduce adipose tissue.

For weak patients it is safest to do the concentric movement at first without resistance at all, the length of the

lever making the moment of weight very great without the added pressure. With very weak individuals it may even be necessary to begin by lifting one leg at a time.

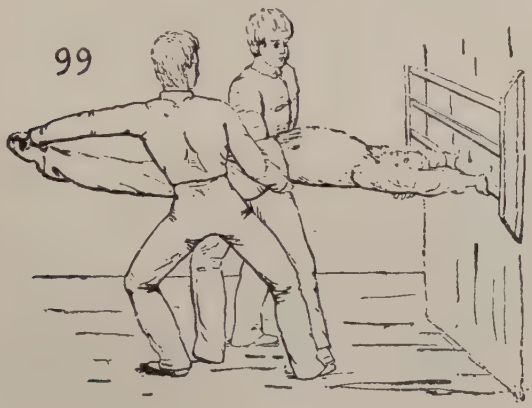
Similar movements are cr. *b.* reclin. exc. hip flex. (fig. 97), and fallhang. exc. hip flex. (fig. 98). Both are milder than the one just described, and produce a down-

ward pressure on the posterior aspect of viscera, the psoas-iliacus being more active than the external obliques



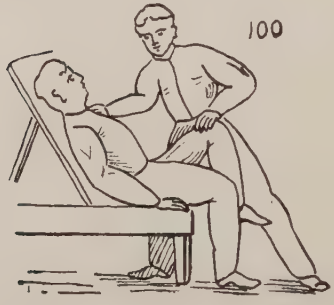
(owing to the difference of com. pos.). The extreme of this movement is shown in fig. 99.

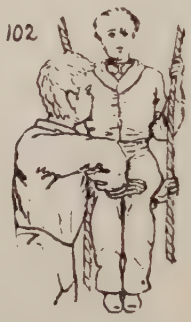
Cr. a *reclin. hip flex.*—(Fig. 100). The patient is



reclining with feet on the floor. The operator stands at the side, places one hand against the patient's shoulder,

the other on his knee, and resists while the patient lifts that knee. Having reached the voluntary limit of motion, the operator pushes the movement to the passive limit, and then presses the patient's knee down while the latter resists. The movement is repeated three or more times.



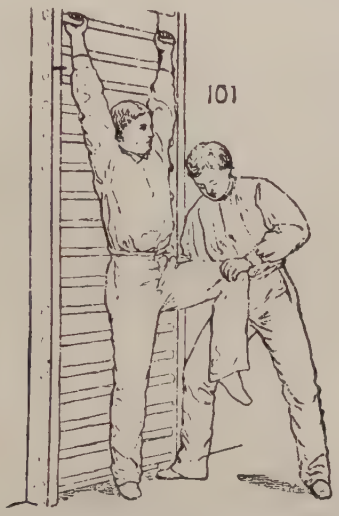


The effects are similar to those of ly. 2 Hip flex., only far milder, and confined more to the inferior one-half of the abdomen (the chest being relaxed). If the movement is applied in pelvic disease, it is best to resist only the upward movement, or at least to place the arms in rest, or str. gr. pos. (so as to prevent internal depression).

If the movement is given to cause a pressure on the colon, the concentric movement (resist the coming up) is applied on the right side, the excentric (push down) on the left, so as to conform to the motion of the con-

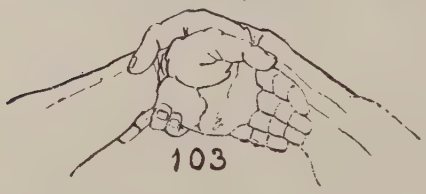
tents of the colon—ascending on the right, descending on the left.

The movement may also be done from str. gr. st. pos. (fig. 101), and from Cr. *a* hang, which both are consider-



ably stronger. There is also 2 Cr. *a* hg. exc. 2 Hip flex. (fig. 102), which is the strongest of this group. The extreme of the movement is shown in fig. 103.

Reclin.passive hip flex.—Standing at the side, the operator grasps the patient's leg with one hand just above the popliteal space, the other just above the heel, and presses the leg as far up as muscular resistance will per-



103

mit. If the tension is to be localized to the glutei, the knee should be flexed (fig. 104); if to the hamstrings, it should be extended.

The movement is used as a means of stretching the sciatic nerve (in sciatica), and of producing vascular expansion in the leg (to relieve a back-ache, pelvic congestion, etc., etc.).

Cr. a *reclin L. ext.* (Fig. 105). The operator stands in fallout pos. at the patient's side, half facing him; holds the patient's leg in cr. *a* pos., his proximal hand grasping the heel from outward, the leg resting over his fore-

arm, and the distal hand grasping over the instep. Gradually removing his weight into the distal leg (which bends, the other one stretching), he offers a moderate resistance to the patient's effort of stretching his leg. The movement is repeated six or more times, the return to com. pos. being passive.

This exercise secures strong afflux to the leg with a minimum of expenditure of energy. It can be given to even the weakest patients (even those with organic heart disease) and is commonly used as a finish to cr. *a* reclin. hip circ. described in preceding pages. Besides causing a powerful acceleration of the pelvic circulation without increasing the muscular activity of that region, the movement also exercises those muscles which secure stability of base in the upright posture. The ease of position, the gentleness of effort in execution, and the extent of its effects, make the movement appear frequently in medico-gymnastic prescriptions.

Forward lying hip extension. The patient is in forward lying position, lengthwise of the bench. The operator has his left hand on the back of the patient's thigh, his right hand on the ankle. The hands should be turned in toward the median line. Resistance is made with both hands, the pressure being greater with the upper

hand. The patient's knees must be kept straight. The number of times that resistance is applied is regulated according to the strength of the patient.

This exercise is used in cases of lateral curvature, to raise the lower hip, to correct any inequality in the hips, to develop insufficient glutei muscles. It secures a strong afflux to the legs.

Reach gr. high 1–2 st. hip flex. and ext. The patient stands as in Fig. 91. As he raises his leg to *Cr. a* position, the operator makes resistance on the thigh just above the knee. As the patient extends the hip the resistance is reversed and is given under the thigh above the knee. This exercise may be used in cases similar to those just described, and also to develop the flexors and extensors of the thigh. In cases of scoliosis, it may be given with the arm of the low side in rest, shelter, or stretch position.

This is a movement of great value in obstinate constipation and disorders of digestion. In pelvic troubles, if resistance is given with flexion only, it should cause internal elevation.

Stoop fall. hip ext. The patient takes stoop fall. position, and the resistance is given as in *forward lying hip ext.* This is a very strong exercise, and should be used with caution. It is useful in retarded menstruation, constipation, etc.

Reach gr. courtesy st. 2 Kn. ext. The patient stands close to the stall-bar in *courtesy st.* position, and grasps with both hands at shoulder height. The operator gives resistance by placing both hands on the hips, as the patient rises. This causes strong afflux to the legs and develops the quadriceps extensor muscles. It may be used in cerebral congestion or retarded menstruation.

Str. instep gr. courtesy 1–2 st. Kn. ext. (with abdominal pressure). The patient stands with his back to the stall-bars and grasps between the third and fourth bar, as in Fig. 32, with the forward knee bent, the arms in stretch position. The movement requires two operators. One gives resistance at the hips, as in the preceding movement, while the other, placing his hand on the abdomen, gives upward pressure as the patient straightens the knee and assumes *st. pos.* The commencing position provides for the expanded chest, and the movement in connection with the abdominal pressure produces internal elevation.

1–2 str. wg. instep gr. courtesy 1–2 st. Kn. ext. The patient stands in stretch position with left arm, while the right leg is back on the bar, and *vice versa.* In other ways the movement is similar to the one just described, but it has much less effect, and therefore may be used as a preliminary movement.

Wg. yd., or rest st. 2 Kn. flex. The patient stands in

either of the three commencing positions. Resistance is given to the movement by bending the knee with the hands placed under the axillæ ; to the upward movement with the hands placed on the crest of the ilium. This is used to develop the flexors and extensors of the thigh, and to relieve congestion in various parts of the body.

Str. st. 2 Kn. flex. The patient's arms are in stretch position, and the resistance is given at the wrist to the movement of bending the knees. The operator stands behind and above the patient (on a chair or stool). This is similar to the preceding movement, but it has a stronger effect.

Reclin. finger flex. and ext. (This may be given in *sitt.* or *st. pos.*) The resistance is given first on one side, then on the other. It may be localized to any part by grasping with the other hand just above the desired joint. It is used to further the flexibility of the joint, in cases of rheumatism, adhesions, writer's cramp, and other forms of paralysis.

Wrist flex. and ext. (Taken in *reclin. sitt.* or *st. pos.*) The patient rests his elbow on his knee, or some other support. Resistance is given alternately to the palmar and dorsal surfaces. If only one set of muscles is affected the resistance is given to that side only. This movement increases flexibility, improves nutrition, strengthens the muscles, etc.

Forearm flex. and ext. (Taken in any of the positions just named.) The operator stands or sits facing the patient, with one hand grasping just above the elbow, to localize the effect to the elbow and forearm. With his other hand he gives resistance at the patient's wrist, first on the dorsal, then on the palmar side, or on only one side, as the case requires. The effects of this movement are similar to those of the one just described. It is more effective in drawing away the blood from other regions, as larger muscular masses are brought into action.

Arm flex. and ext. (From the same positions as above.) The patient's arm comes to bend pos. (as in Fig. 40. 2). Grasping at the wrist, the operator gives resistance as the patient stretches the arm sideways, upward, or forward, as desired. There is a still stronger effect of drawing the blood away from other regions. The nutrition to the arm is increased and the muscles strengthened.

Str. sitt. 2 A flex. and ext. The patient sits with arms outstretched over the head. The operator stands behind and grasps as for str. sitt. 2 A. circ. (see Fig. 47). The resistance is given as the patient draws the arms down to bend pos. Ordinarily, it is omitted as the arms are extended. This movement is given to increase the afflux to the arms, and to produce chest expansion and internal elevation. It may also be given from squat sitt., fall sitt., reclining or lying. The more nearly upright is the pa-

tient, the higher will be the effect. The more the patient reclines, the lower the effect and the greater the elevation of the internal organs.

Wg. stoop sitt. Back ext. The patient sits on a stool or couch, hands on hips and body bent forward to stoop pos. (see Fig. 35). The operator stands or kneels behind, and gives resistance with crossed hands (palms inward) to the patient's back between the shoulder-blades. The patient rises to slightly beyond vertical position. This movement is indicated in lung troubles on account of the effect it has of elevating the chest; also in neurasthenia, for its effects on the spinal nerves, vessels, and muscles. With the rotated trunk it is used in cases of scoliosis, the rotation being decided by the exigencies of the case. It may also be used for weak backs, backache, and lumbago. The movement may be varied by giving with the arms in rest, 1-2 str., and str. positions, all these being stronger movements. It may also be given in forw. ly. position, with the arms in any of the foregoing positions, and is then still stronger. In scoliosis, it is often well to place a book under the side of the low hip to level the hips in the commencing position.

Reach stoop lean st. Back ext. The patient stands leaning against the horizontal bar so that it supports the abdomen. The arms are forward in reach position as in Fig. 41. 1. The operator sits facing the patient on the

opposite side of the bar, with one foot braced against it. The patient and operator grasp each other around the wrist, and resistance is given as the patient rises to vertical position. The arms should be kept straight, and the movement should occur through the action of the back muscles instead of through those of the arm. This is a strong movement with effects similar to the other back extensions.

Wg. ride sitt. Tr. sidew. flex. The patient sits astride a high couch, as in Fig. 49. The operator stands behind and gives resistance under the patient's arms, with the hands placed flat against the body, palms turned in, fingers pointing forward, as the patient bends first to one side, then to the other. This has exaggerated effects of all sideways flexions. It improves the circulation from the abdomen and pelvis, it increases the activity of the liver, and it aids digestion. It may also be given with the arms in 1-2 str., rest or stretch position. In sitting position, it is often given in cases of scoliosis, and usually then with the unilateral position of the arms, flexion, of course, to one side only. It is used for dyspepsia, torpid liver, constipation, etc. In 1-2 str. position the start is made with the body bent to the side of the wing arm, and the resistance is given at the elbow as the body returns to vertical position. This movement may be taken in step st. position. This requires two operators. One

sits in a chair. The patient stands in front of him and places one foot on the chair between the operator's knees. The operator passes one arm under the patient's knee and brings the hand around until it grasps his other arm. He has thus assumed the position of folded arms, while encircling the patient's knee. The patient bends to the side of the foot on which he stands, and as he returns to vertical position, the second operator (standing behind) gives resistance according to the position of the patient's arms, — under the arm if in wg. position, at the elbow if in rest or in 1-2 str. wg. position.

Lean st. sideways flex. This is commonly used for scoliosis, and is given with unilateral positions of the arms either 1-2 rest wg., 1-2 str. wg., or 1-2 shelter wg. This is done leaning against a bar or other support (the bar at the left side with flexion to the right, and *vice versa*) in order to prevent the hips from swaying. This may also be given in wlk. B st. position, as this serves to raise the hip and produce rotation to the opposite side.

Wg. fall sitt. T. forw. flex. The patient sits in fall. sitt position (see Fig. 12) with hands on the hips. As he bends forward, the operator, standing behind, gives resistance with hands placed on the shoulders, fingers pointing forward and downward. This movement should be given with great care, as it produces strong contraction of the abdominal muscles from above downward.

Under certain conditions it might produce internal depression, therefore it should rarely be used if there is any pelvic weakness. It is very useful in constipation, provided the above conditions are observed. It produces chest expansion. This may be used from think or stretch positions, each of these being a stronger movement and productive of greater chest expansion. The think pos. is ordinarily used with the excentric form of the movement, where the patient takes stoop sitt. pos. (see Fig. 11) and makes the effort of retaining that position while the operator draws him back to fall. sitt. pos. The excentric form may also be used with the arms in wg. or str. pos. and is milder than the corresponding concentric movement.

1-2 rest wg. sup. wlk. B. st. T. forw. flex. The patient stands with left arm in rest position, right arm in wing, the left foot one step in advance, supported only by the heel. The operator gives resistance as in the other forward flexions as the patient bends the trunk forward. The movement is given several times on one side, then as many times on the other. The commencing position produces a strong tension in the lumbar region, which is increased by the movement. It has the effect of straightening the lumbar spine and hence is useful in lordosis. The movement may be made still stronger by using 1-2 str. wg. for a commencing position.

1-2 str. sitt. T. sidew. ex. with vibr.— The patient sits on a couch in ride sitt. pos., with one arm in str. pos. The operator grasps at the wrist and draws the patient over to the opposite side, at the same time stretching the arm well up, and giving vibration. It is used in scoliosis to extend the short side. The vibration has great effect in loosening up the tense muscles; this can be given in 1-2 step sitt. pos. In this the patient sits with one foot supported on the round of a chair or some similar support, the supported foot being on the side of the low hip.

Flex. and ext. of the jaw.— The patient sits with open mouth. The operator stands in front and puts both hands under the patient's jaw, fingers crossing, the thumbs resting behind the canine teeth. (Put a handkerchief over the thumbs.) Resistance to the flexion is given by the thumbs and to the extension by the fingers. It is used to improve the action of the pterygoid and masseter muscles, and is used in periarthritis of the jaw.

ELEVATIONS AND DEPRESSIONS.

Arm elev. and depression sidew.— This may be taken either sitting or standing. Resistance is given by the operator just above the elbow. The grasp changes as the arm is lifted, being above the arm when the latter rises, below the arm when it is lowered. The arm must be straight from shoulder to finger-tips. The movement is

given for its effect on the muscles. It affects especially the deltoid and supra-spinatus. To affect the superior fibres of the pectoralis major, place the arm so that it forms a prolongation of these fibres; that is, obliquely downward and forward. Turn the arm out a little, and move the arm up towards the point of attachment under resistance. After pleurisy, atrophy of the pectoral muscles, (especially the major) is very common; then this movement might be indicated. It is also used in cases of muscular rheumatism. It may also be used to raise the low shoulder in scoliosis.

Yd. d. sitt. (2) A elev.— The patient is sitting in yd. d. position, with the palm upturned. The resistance is given just above the elbow, as in the preceding. This especially affects the trapezius. It has a slight affect on the supra-spinatus. The movement may be given in rheumatism, to raise low shoulder in scoliosis to develop the muscles, etc.

Side ly. L. elev. sidew.— The patient lies on his side, the operator gives resistance to the elevation of the leg, placing the hand just above the knee. The movement affects principally the tensor vaginæ femoris and slightly the glutei group. It is given in scoliosis to raise the low hip. The position of the arms may be regulated according to the case.

Side fall. L. elev. sidew.— The patient is in side fall.

pos. (see Fig. 38). The movement is similar to the preceding in its execution and effect. This movement may be given in side gr. stand. pos. (see Fig. 39). This is principally used to raise the low hip in cases of scoliosis.

Forw. ly. L. elev. and depress.— This is almost identical with forw. ly. Hip ext. (already described), except that the movement of lowering the leg may also be resisted.

Cr. a reclin. Kn. depress. is similar to cr. a reclin. L. ext. (see Fig. 105).

Str. gr. cr. a 1-2 st. Kn. depress.— The patient is in the position described in Fig. 101. The operator stands at the side and places one hand under the leg, just above the knee (the right hand for the left leg, and *vice versa*), the other under the arch of the foot, and gives the resistance as the patient depresses the knee to standing position. It is given especially to affect the quadriceps extensor.

Str. gr. ly. 2 L. elev. is similar to str. gr. ly. 2 Hip flex. (Fig. 96). The same movement as described on page 151.

Backward ly. Pelvic elev.— The patient is lying on the back, the knees are bent, and the feet are flat on the couch. This is not strictly a resistive movement. The patient simply elevates the hips, so that there is a straight line from the knees to the shoulders. This movement is used for anteversion.

Prone ly. Pelvic elev.— The patient is in prone lying

pos. (see Fig. 5); the hips are elevated (without resistance) so that the body is in line from the shoulders to the feet. This may be done about four or five times at first, and afterwards increased according to the strength of the patient. It is used for retroversion. It is contra-indicated in anteversion, and the back. ly. is contra-indicated in retroversion.

ABDUCTIONS AND ADDUCTIONS.

Yd. recl. 2 A abd.— The patient is reclining with the arms in yd. position, with palms of the hands turned forward. The operator is in wlk. b pos., with the forward foot between the patient's feet. The grasp is at the patient's wrists, and as the patient resists, the operator puts the arms forward to reach pos. The patient then draws the arms back to commencing position under resistance. This is to be repeated six or eight or more times, according to the strength of the patient. It is given to strengthen the muscles of the shoulders, so as to correct round shoulders, to expand the chest, etc. The progression is made by changing from reclining to sitting, stoop sitt., standing, stoop st., fall. b or fall. d, and forw. ly. The last three are very strong movements. The movement becomes stronger as the trunk inclines forward, for the lever of the weight then increases, and the muscles of the shoulders and back must be active to retain the com-

mencing pos. as well as to do the movement of abduction. For convenience we write the list as follows: —

Yd. reclin.
" sitt.
" stoop sitt.
" st.
" stoop st.
" fall. b st.
" fall. d st.
Forw. ly.
} 2 A abd.

Yd. sitt. 2 A add.— The patient is in sitt. pos., the arms in the same position as in the preceding movements. The operator stands as above, and grasps in the usual way. He gives resistance as the patient draws the arms forward. The excentric form may also be used, where the patient makes the effort of holding the arms in reach position, while the operator pushes them back. This movement is used for emphysema only, as its effect is to decrease the capacity of the chest. In all other cases the aim of the medical gymnast is to increase the chest capacity. The movement may also be given in standing pos., and is then somewhat stronger. The latter position does not affect the action of the muscles, but the position requires more co-ordination and control than the other, and therefore volition is divided.

Yd. e sitt. passive 2 A abd.— The patient is sitting in yd. e pos. (see Fig. 40.8). The operator stands behind and grasps patient's upper arm from the front just above the elbow; the patient grasps the operator's arm midway between the shoulder and elbow. The operator pulls the patient's arms backward, a little at a time, with a vibratory movement. This is a very strong movement and very effective for the round-shouldered and the chest-bound.

Finger abd. and add.— The operator gives resistance as the patient separates the fingers and then draws them together. The movement is used to increase the mobility of the joints, and for paralysis, writer's cramp, etc.

Cr. a reclin. 2 Kn. abd. and add.— The patient is reclining with the feet supported, so that the knees are bent to cr. a pos., as in Fig. 9. The operator gives resistance by placing his hands on the outer side of the knees while the patient pushes them apart, and the inner side of the knees as the patient draws them together. The abduction should be given first. The movement is used for internal elevation and for pelvic diseases. The lower portion of the psoas iliacus, the adductors, and the muscles which form the floor of the perineum are the ones used.

Cr. b reclin. 2 L. abd. and add.— The patient is in position of Fig. 8. The operator grasps the patient's legs near the ankles and gives resistance as above. The movement resembles the preceding.

Rest ly. 2 Hip elev. with 2 Kn. abd. and add.— The position of the patient has been described in Backward ly. Pelvic elev., and his arms are in rest pos. (Fig. 40.3). 2 Kn. abd. and add. is given in the same manner as in cr. a reclin. 2 Kn. abd. and add., and the effect is similar but stronger.

Hanging 2 L. abd.— The patient hangs from a horizontal bar or upper stall-bar. The operator stands behind and gives resistance at the ankles while the patient pushes the legs apart. The patient then makes the effort of holding the legs apart while the operator pushes them together. The first is the concentric form of the movement, and the second the excentric. This is used especially in scoliosis to increase the weight on the spine and to straighten it. This may also be used to relieve spinal congestion, as the hanging pos. stretches the spinal veins, and thus increases the circulation, and the resistive movement draws the blood to the legs.

2 cr. b hang. 2 L. abd.— The patient hangs with the legs lifted forward so that the hips are bent at right angles, while the knees remain straight. Resistance is given at the ankles, as in the preceding movement. This is a strong abdominal movement, as the abdominal muscles must be active to retain the commencing position, while the abductors of the thigh do the movement. This may be used for lordosis, provided the strength of the

patient is sufficient to enable him to do the movement This is more suitable for men than for women.

Ly. 2 L. abd.— The patient is lying on the back. The operator gives resistance at the ankles while the patient pushes the legs apart. This is used for bow-legs.

Ly. 2 L. add.— The patient lies on his back with the feet separated. The operator gives resistance on the inner sides of the ankles while the patient pushes the legs together. This is used for knock-knees.

ROTATIONS.

Rotations may be either passive, active, or resistive. Passive rotation increases the mobility of the joint, and may sometimes be given to a joint that is incapable of an active rotation. If a joint is too stiff to allow the movement of circumduction, passive rotation may sometimes be used, which will gradually lead up to the circumduction.

Reclin. L. rot. — The patient reclines on a couch; the operator sits in the same position as for reclin. F. circ. (Fig. 42), and steadies the patient's leg, just above the ankle, with one hand, while he gives resistance to the side of the foot with the other. If used for its effect of increasing the nutrition of the limb, resistance is given to both outward and inward rotation. If given for its effect of developing the contractility of the external

rotators of the thigh, or to correct toeing in, resistance is given to the outward rotation only. For the inward rotators of the thigh, and to correct toeing out, use the inward rotation only. The outward rotation, by causing a contraction of the anterior and posterior abdominal muscles, the external oblique, the psoas and the iliacus, produces internal elevation, and improves the arterial supply to the lower pelvis. The movement is often used in paralysis.

Cr. a reclin. L. rot. — The patient reclines, while the operator sits at one side as in Reclin. Kn. flex. and ext. The operator steadies the patient's thigh just above the knee with one hand, while with the other he grasps the patient's foot with his hand in the hollow of the foot, the thumb on the inside. This is a passive movement, and it is often given combined with vibration. The rotation is inward or outward, as the case requires. This should be given with care. It may be used in displacement of the semi-lunar cartilages of the knee-joint.

Yd. reclin. A. rot. — The patient is reclining with the arm stretched straight out to the side. The operator stands and grasps as for shaking hands, and gives resistance as the patient rotates the arm. If given for the general nutrition of the arm, resist the rotation in both directions. If to strengthen weak muscles, resist only

one way, according to whatever muscles it is desired to affect. The outward rotation will produce chest expansion, and the further back the arm is carried, the greater will be the effect. The outward rotation may be used in scoliosis to flatten the protruding scapula.

Reclin. Forearm rot. — The patient reclines; the operator sits a little to one side, facing the patient. The grasp is as for shaking hands, and the movement is confined to the forearm by holding with the other hand the patient's elbow firmly against his side. The effect of this is principally on the muscles of the forearm. The same principle for resistance either one or both ways applies in this movement as in the preceding ones.

1-2 Str. sitt. A. rot. — The patient sits with one arm upstretched over the head, holding some light apparatus like a dumb-bell or wand. The operator gives resistance to the outward rotation of the arm. The movement is used in scoliosis to raise the low shoulder and flatten the shoulder-blade.

Wg. st. T. rot. — The operator stands behind the patient, one hand placed in front of one shoulder (the left when the movement occurs to the right and *vice versa*), the other hand behind the other shoulder, and gives resistance with both hands, pulling with one and pushing with the other, as the patient rotates to the side, keeping his feet still. The operator stands with feet

apart, and sways from side to side, as the patient moves, so as to keep the resistance as nearly as possible at right angles to the movement. This has an exaggerated effect of all trunk rotations. It exercises the abdominal muscles, increases the circulation from the abdomen, and expands the chest. The movement may be made stronger by placing the arms in rest or stretch position, and may also be given in Kn. st., ride sitt., fall. sitt., or forw. ly. positions. The straighter the hip-joint the lower down is the effect. In sitt. T. rot., the first lumbar vertebra is the pivot. There is no rotation in the lumbar vertebræ, or between them and the pelvis. For chest expansion give the movement in ride sitt. pos.; for internal elevation use Kn. st. or st. pos. With fall. sitt. pos. the movement becomes a strong abdominal exercise. In forw. ly. pos. the muscles of the back are chiefly used. It produces strong chest expansion.

Wg. ride reclin. T. rot. — The patient and operator are in the same positions as for wg. ride reclin. T. circ. (Fig. 50). Let the patient rotate the trunk as far as possible to one side; the operator gives resistance as the patient comes back to position. Repeat this four or five times, according to the strength of the patient, then change the grasp and do the same on the other side. This movement is suitable for weak patients; the effects are similar to other movements of this class.

Wg. ride sitt. pass. T. rot. — The patient sits astride a couch or bench, the arms in wg. pos. The operator grasps the patient's shoulders, and gives the rotation from side to side quickly. It is used to increase the activity of the air-cells.

Wg. stoop ride sitt. pass. T. rot. — The position is the same as the preceding, except that the patient's trunk is inclined forward. The movement is used as a substitute for abdominal vibration, to increase the peristalsis and relieve constipation, or as a counter-irritant in diarrhœa.

Yd. Kn. st. quick pass. T. rot. — The patient kneels on a couch, with the arms in yd. pos. The operator stands behind, supporting the patient's sacrum with the side of his knee. He grasps the patient's arms about half-way from shoulder to elbow, lifts the trunk up slightly, and gives rotation quickly from side to side. The movement may be given with the patient's arms in wg. or rest pos., but the yd. pos. is preferable because the blood will flow more easily into the arms away from the abdomen and chest. It produces a vibration in the lower part of the pelvis, and increases the circulation from that region. It is used in diseases of women, to relieve pelvic congestion, to overcome retarded menstruation, etc.

Str. gr. st. Hip rot. — The patient stands under the horizontal bar, the arms stretched upward and grasping

the bar. The operator's hands are placed on the patient's hips in the same manner as on the shoulders in T. rot. The resistance is also given similarly. The patient should keep the face straight forward in order to confine the movement to the hips. It may be given in a doorway, with yd. e grasp (Fig. 40.8). This movement may be used in scoliosis to overcome the rotation in the lumbar region.

Sitt. H. rot. — The patient sits with hands on the knees. The operator stands behind, with hands placed one on each side of the patient's head and curved so as not to press on the ears. The resistance is given first on one side, then on the other, unless the muscles of one side only are affected. It is given to strengthen weak muscles, and used in rheumatism, stiff neck, torticollis, etc. The movement may also be given from stoop sitt. pos.; it then becomes slightly stronger.

Passive H. rot. with vibration. — The operator stands behind and grasps as above. He rotates the head as the case requires, combining it with the movement of vibration. It is used to extend tense muscles, as in stiff neck or torticollis.

Synopsis:

Other Single, Assistive, and Resistive Movements.

- **Kinds.**
  - Concentric.
  - Excentric.
  - Manual.
  - Mechanical.
- **Types and Species. Mechanics.**
  - Single: as educational gymnastics.
  - Assistive: operator helps.
  - Resistive: Operator or Patient resists.
    - Begin and end gently.
    - Smooth and even.
    - Power according to patient.
- **Effects.**
  - General
    - Increase of
      - cerebration.
      - co-ordination.
      - voluntary control.
      - motor irritability.
      - heart-beat.
      - blood-pressure.
      - metabolism.
      - hardness of fibrous tissue.
    - Decrease of
      - sensory irritability.
      - adipose tissue.
  - Local — Increase of
    - afflux.
    - nutrition.
    - neurition.
    - muscular sense.
- **Therapeutic Uses.**
  - General — To increase
    - arterial circulation.
    - nutritive activity.
    - cerebro-motor activity.
  - Local
    - To increase absorption and nutrition.
    - To cultivate motor neurition.
    - To increase muscular contractility.
    - To restore absent movements.

PART II.

Medico-Gymnastic Therapeutics.

Disorders of the Circulation.

In discussing the diseases due to abnormal circulation, it is necessary to consider first of all the proper position, mechanism, and action of the heart. The heart is a hollow muscular organ made up of a peculiar type of muscular fibres. It is situated obliquely in the chest, enclosed in the pericardium. The base is on a level with the third costal cartilage, one-half inch to the right and one inch to the left of the sternum. The apex is between the fifth and sixth costal cartilages, two to two and one-half inches below and one and one-half inches within the left nipple. The force of the heart's action externally is different in different persons, according to the thickness of the chest walls, the size of the ribs, etc. The external characteristics of the valves are as follows: according to the divisions of the heart and their relations to each other, the pulmonary valve is highest in the thorax, the aortic is behind the pulmonary, a little lower, and a little more to the right, just behind the sternum on a level with the lower border of the third rib; the mitral valve lies deeply within the chest at the left edge of the sternum on a level with the

upper border of the fourth costal cartilage; the tricuspid is behind the median line of the sternum on a level with the fourth costo-sternal articulation. In examining the heart, one must listen at all these valves, but not at these exact spots. There are certain places where the sound is best conducted. The pulmonary orifice is at the second left intercostal space, known as the pulmonary area. The aortic area is at the second right intercostal space. The mitral area is at the apex of the heart, between the fifth and sixth ribs, one and one-half inches within and two to two and a half inches below the left nipple. The tricuspid area is at the base of the ensiform cartilage.

The heart is a force-pump, working on mechanical principles. By opening the chest and pumping up artificial respiration, we can observe a complete cardiac cycle. First we observe the contraction of the great veins near the heart, these contractions run like a peristaltic wave towards the auricles; arriving there the wave spreads rapidly to the whole heart. The auricles contract and in so doing press the blood through the opening into the ventricles, which become swollen. Then comes the ventricular systole, when the aorta and pulmonary artery slowly expand and the heart twists on a longitudinal axis from left to right, the apex becoming slightly tilted upward and approaching the chest wall,

producing the beat. While the auricular systole is taking place, there is a pause in the ventricular, while the ventricular systole takes place the auricular diastole occurs. After the ventricular diastole there is a slight pause of the whole heart. With the hand on the chest over the apex, a slight shock is felt at each beat, this occurring with the systole of the left ventricle: it is a result of a hardening of the walls and the apex coming in contact with the chest walls. When we place a stethoscope on the chest, we hear two sounds, the first long, dull and booming, the second short, sharp and sudden. Between the first and second sounds there is a short but hardly appreciable pause, between the second and the next there is a distinct pause. The second sound is produced by the closing of the semi-lunar valves, and when the heart is diseased this sound is replaced by murmurs. The first sound is probably of double origin, and is the sound of muscular contraction plus the closing of the mitral and tricuspid valves. This sound is changed by disease and since the mitral valve is usually affected, the space to listen is between the fifth and sixth ribs at the apex. If the tricuspid is affected we must listen over the ensiform cartilage.

The pulse is caused by an intermittent change in the shape of the arteries due to an increase in the tension of the arteiy-walls following a contraction of the heart.

Normally, the pulse is perceptible only in the arteries, but in illness one may be felt in the veins. The character of the pulse beat may be determined by a sphygmograph.

Diseases of the heart include diseases of the pericardium, diseases of the valves, including diseases of the endocardium and diseases of the arteries and veins.

Pericarditis is inflammation of the pericardium, the closed membranous sac which envelops the heart. It is caused by rheumatism, by acute or chronic infectious diseases, by Bright's disease or by extension of inflam mation from neighboring parts.

The symptoms include fever, great pain if there is no effusion, otherwise pain is slight, an irregular heart's action, which is difficult to distinguish when fluid is present.

This form of heart disease can not be treated by medical gymnastics.

Myocarditis is inflammation of the muscular tissue of the heart. Usually there is septicemia produced by bacteria. Myocarditis may be secondary to *pericarditis* or to *endocarditis*. It may be acute or chronic. If the latter, the patient is said to have a "weak heart." Acute myocarditis causes extreme pain, while the pulse is rapid and weak.

The treatment may include passive procedures to

hasten the return current. Kneading and circumduction are specially indicated. Resistive movements of the arms and legs may be given to accelerate the action of the heart and to lessen the blood-pressure. Great care must be taken in giving these movements.

Endocarditis is inflammation of the membrane that lines the heart. The disease usually affects the valves on the left side but if ante-natal the right heart may be affected and may not give any symptoms till quite late.

The most frequent causes are bacterial infection and acute rheumatism. Chorea often causes this disease in children.

The valves become incomplete or incompetent to do their work. They may be stenosed from a thickening of the tissues and so fail to close completely, or they may break down and this insufficiency prevents the valves from closing tightly. The mitral valve is usually affected. The aortic valve presents the most dangerous affection.

As there is an excess of blood in the auricles, the heart has to work hard to get rid of it, and this makes a rapid heart beat. The murmurs are caused by the sounds that accompany the closing of the valves.

The acute form of this disease is rarely fatal unless there are complications. Usually the lesion remains and the heart compensates itself by hypertrophy. If

the lesion increases or the heart dilates, there will be no compensation.

In the treatment use passive procedures, resistive movements of the extremities, and educational gymnastics. Give heaving movements only with great care There should be no running, (at least in the beginning) and no jumping or vaulting. With acute lesions, you may give passive procedures, if you keep away from the seat of the lesion.

Tachycardia is a neurosis of the heart and is characterized by excessive rapidity of the heart's action. The heart seems to flutter, and there is more or less of dyspnea, and the pulse may ran up to 200. As a rule there is no lesion. It arises from centric, reflex or mechanical causes. If centric, it is probably due to some lesion in the frontal lobes. Any cerebral or spinal irritation may cause it, especially if the patient is overworked. The reflex causes are dyspepsia, intestinal irritation, and certain articles of diet as tea, coffee; it may be caused by excessive use of tobacco. The mechanical causes are emphysema, tight lacing, pressure, etc. During the attack, give arm circ., movements of the extremities and pass. procedures. For general treatment, give educational gymnastics.

Tremor Cordes is the opposite of palpitation. It is found usually with myocarditis in healthy hearts. It is of nervous origin. The heart begins to tremble and flutter, the pulse sinks to a mere thread and seems to stop. The attack lasts but a few moments. There is no faintness. It is caused by flatulency or by cardiac distress. In cases of this kind first remove the cause and then give general treatment.

Angina Pectoris may be divided into true *angina pectoris* and pseudo or false *angina pectoris*. In true angina there is intense pain near the heart. It is accompanied with a sense of impending death. It is usually found in men. There is probably more or less ossification of the walls of the coronary artery — a sudden high tension in the artery, and then a spasm of the heart to overcome it. The prognosis is bad. The patient may die during an attack. One attack predisposes to another. There should be no treatment during the attack. Between the attacks give general treatment tending to reduce the blood pressure and to build up the general health.

Pseudo angina is usually found in women, and it is entirely due to neurasthenia. It is purely a neurosis. The average duration of the attack is about one hour. The pain is of a radiating character and less severe than in true angina. The patient has no dread of death. The

arterial tension is not increased. There is a compressible pulse ; vomiting is common. Treat as in all other nervous diseases, but be careful in giving treatment during an attack. If the severity of the pain lessens under treatment continue until the patient is quiet.

Fatty heart may be of two kinds. There may be *fatty infiltration* or *fatty degeneration*. In infiltration the fat is between the fibres, both outside and inside. Trouble comes from the extra pressure. The disease is curable by diet, exercise which includes movements in both medical and educational gymnastics and a certain amount of medicine. In fatty degeneration there is no cure as the proteids of the fibres are changed into fat. This occurs during middle age, and oftener in men than in women. A predisposition may be inherited. Massage will give relief, but will not effect a cure.

Arterial Sclerosis or Atheroma is a hardening of the coats of arteries accompanied with a chronic inflammation. It is really a degeneration. The inner coat is thickened by an increase of connective tissue, the lumen becomes narrowed, and this increases arterial tension. The coat may undergo fatty degeneration. Usually the heart and kidneys are involved because peripheral resistance is increased, so the heart's work is increased and we get hypertrophy and dilatation. Resistance will also be

increased in the kidneys, so there will be a lesion in that region followed by degeneration. The lesion may be localized or it may be distributed about the body. When localized it is generally in the brain or kidneys. It is usually found in middle life, and oftener in men. Alcoholism, lead poisoning, diabetes and gout are predisposing causes. The prognosis of the disease itself is good, but there is always danger of brain, heart or kidney disease and then the prognosis is bad. If patient shows passive congestion and has rigid arteries these may be regarded as symptoms of the disease. Give passive procedures with light resistive movements of the extremities. Give percussion of the head to relieve the congestion and keep the skin active to relieve the kidneys. Decrease the arterial tension by increasing the return currents.

Aneurism is due to weakness of the arterial walls. The walls become dilated from blood pressure. The weakness may be caused by high arterial pressure, by arterial sclerosis, or by severe muscular exercise. It may be due to bacteria. Usually there are blood clots in the cavity and sclerosis of the rest of the artery. The affected part is like a pulsating tumor. From the tumor there is pressure with pain. The most common site of aneurism is the bend of the aorta, and here there is pressure in the superior vena cava, which causes congestion of the head, etc.

There is no treatment and the patient usually dies from the rupturing of the aneurism.

Thrombosis and Embolism. When blood coagulates in the heart or in the arteries and the clot obstructs the passage of the blood the clot is called a thrombus and the affection is called thrombosis. When a particle of matter is loosened from a certain point and travels around in the circulation until it finds a lodging place where it obstructs the flow of the blood, the affection is called embolism, and the little particle of matter is called an embolus. An embolus may be a part of a blood clot, a mass of bacteria, a fragment of vegetation on the heart, a fragment of a tumor, or a bubble of air. The obstruction lies against the wall of the vessel and either partly or wholly occludes it. These obstructions may result from injury, from alcoholism, gout, syphilis, or bacteria. While the epithelial lining of a vessel is intact, there cannot be a thrombus. The effect of these obstructions is to deprive that particular region of blood, and if the site is the brain there will be unconsciousness, and if the area is large death will result. If the embolism is in the extremities so that collateral circulation can be established no harm follows, but if the embolism is in a terminal vessel the result is death of that part, gangrene and necrosis. If the embolus stops in the heart death results. If the embolus is infective from

bacteria there will be septicemia. If the case is thoroughly understood massage may be used to advantage. Cases are on record where massage has prevented the occlusion of the vessels and whereby the emboli have gradually disappeared.

Varicose veins are usually found in the lower extremities. The veins become enlarged, elongated and tortuous and are sometimes knotted. The trouble begins with a slow dilatation of the vessels, which gradually become thickened and tortuous. The connective tissue increases and inflammation appears. The valves become too short to close the vessels and there is a leaking and back flow of blood. The internal saphenous vein is the one most commonly affected. The trouble is caused by anything which impedes the venous circulation. Persons who stand a great deal are common subjects. It may be caused by abdominal tumors, by diseases of the heart and lungs, or by pregnancy.

Medical gymnastics have been used in this disease with distinguished success. Give passive movements to assist the return current, give a special form of kneading, taking great care not to rupture the veins. (If rupture occurs elevate the leg and apply pressure on the end away from the heart.) Give ulnar percussion, single, across the veins from below upward. Give resistive lateral trunk

movements and abdominal exercises. Between treatments use flannel bandages.

NOTE. Very few diseases of the heart are in themselves the cause of death. If the patient dies, it is usually from some complication to which the heart disease gives rise. In aortic regurgitation death may come suddenly from cerebral apoplexy, the extra force of the heart causing rupture in the brain, usually on the right side, for there the course of the blood is more direct. In aortic regurgitation there is more hypertrophy than in any other form. The hypertrophy may cause pressure on the coronary artery so that blood cannot go through to nourish the heart. True angina pectoris causes sudden death, either from paralysis of the heart, failure of coronary circulation due to spasm, cardiac arterial sclerosis, or shock of pain. Fatty degeneration causes sudden death. Extreme dilatation of the heart will also cause death, either from rupture or from the heart's failure to act. Aneurism of the heart may have a fatal result. Usually the aneurism is in the wall of the left ventricle near the heart's apex. Bright's disease by its action on the heart causes sudden death. The circulation of the kidneys is impeded, throwing extra work on the heart; there is hypertrophy followed by dilatation. The arterioles become fibroused and brittle from the action of the poison from the disease, and the result is a sudden death. Aortic regurgitation is the most common cause of heart failure.

Disorders of the Respiration.

Diseases of the Respiratory Organs consist of affections of the larynx, throat and lungs, bronchial tubes, pleura, and air-cells.

Laryngitis is inflammation of the mucous membrane of the larynx. It may be acute or chronic; tuberculous, syphilitic or ædematous. In acute laryngitis, the membrane is red, congested and swollen, and in severe cases there is superficial ulceration. Mobility of the vocal cords is impaired. In chronic laryngitis, the mucous membrane is thickened and congested and of a yellowish or grayish tinge. In the acute form there is slight fever, hoarseness, spasmodic cough, pain in larynx and difficulty in breathing. In the chronic form, tickling in the throat, an irritating cough, which is worse in dry weather, a husky voice, and a constant desire to clear the throat. Tuberculous and syphilitic laryngitis are local manifestations of systemic disease. Œdematous may come with any of the other forms, due to spreading of inflammation from the surrounding tissue (as in mumps).

Acute laryngitis can not be treated by massage. The chronic form may be benefited by vibration of the larynx, if the mobility of the vocal chords is much impaired. For general nutrition, give resistive movements of the neck. Massage can do nothing for the tuberculous, syphilitic or œdematous types.

Pharyngitis is inflammation of the pharynx. It is also acute or chronic, syphilitic, tuberculous, etc.

Tonsillitis comes from the Latin *tonsilla* meaning a tonsil, and a Greek word meaning inflammation. It

may be acute or chronic. The tonsils are large lymphatic glands covered with mucous membrane. The surface dips down so that we get from 18 to 20 convolutions on each tonsil. A plexus of lymphatics surrounds these and there is everything necessary to promote acute inflammation. In acute pharyngitis or catarrhal tonsillitis, these little lacunae become filled with yellow cheesy exudation. If there are repeated attacks the whole lymphoid tissue becomes hypertrophied, increases in amount, and the tonsils become enlarged and the form changes to chronic tonsillitis. The chief causes are unhygienic surroundings, bad drainage, etc. There are certain common symptoms in all the forms of pharyngeal affections as chill followed by more or less fever, headache, backache, and a feeling of malaise. In the treatment, find the cause and treat that first. If the pharyngitis is chronic, give educational gymnastics. In acute pharyngitis or tonsillitis, provided no pus is present, give vibration and kneading. In chronic pharyngitis or tonsillitis give general massage of the throat and resistive movements. Do not treat the form known as retropharyngeal abscess. Never treat when pus is present.

Pleurisy, otherwise known as *pleuritis* may be acute or chronic. Both may be dry, or pleurisy with effusion. When this effusion contains pus it is called by a special name, *empyema*. Bacteria is invariably the exciting

cause of this disease. Predisposing causes are gout, Bright's disease, rheumatism, tuberculosis, etc. In dry pleurisy, the pleura is congested, becomes dry and loses its shiny appearance. The pleura is coated with serum and fibrin on the contiguous surfaces so that the membranes become thickened and adhere. The pain from pleurisy is generally sharp and stabbing. The breathing is rapid and shallow. A friction-fremitus may be felt on palpation and a to-and fro friction sound heard on auscultation. Pleurisy with effusion is a worse form than dry pleurisy, and empyema is still more severe. Chronic pleurisy may follow acute, or it may be chronic at the beginning. If the latter, it is usually of tuberculous origin. When it occurs every few months with acute exacerbations, it is apt to be the beginning of tubercular phthisis.

Empyema can not be treated by massage. Other forms of pleurisy may be treated by chest vibration and percussion, which cause molecular revulsion and absorption. Resistive respiratory exercises force the adhering membranes apart. In these respiratory exercises the normal rhythm must be exaggerated but *not changed*, *i. e.*, the inspiration and expiration must be lengthened proportionately.

Diseases of the bronchi are known as *bronchitis*, *bronchiectasis* and *asthma*.

Bronchitis is inflammation of the mucous membrane of the bronchial tubes. There are many variations of this disease, characterized as acute, chronic, capillary, catarrhal, croupous, mechanic, putrid, etc. Summer bronchitis is another name for hay-fever.

The lesion is always bilateral. It involves the trachea and large tubes. The mucous membrane is congested, reddened and swollen, covered with mucus and sometimes with pus which need not be septic. The first step in inflammation is an increased blood supply which cannot be taken care of and so it produces congestion or stasis. This is followed by increased heat, swelling and pain. Then follows leukocytosis, increase of colorless or white blood corpuscles in the blood. If the inflammation is not intense, the leukocytes gather up the waste matter and carry it off to the excretory organs. If the vitality is lowered, they cannot do this, so they collect, break down and die, thus forming pus. In bronchitis the mucous pus is not yet septic, but if it is affected by bacteria, it immediately becomes virulent.

The attendant symptoms of *bronchitis* are chills, moderate fever, pain in the bones, especially in the back, general malaise, a feeling of tightness and oppression. There is a cough, first dry and rasping, changing to one that is moist and secretive. This disease is more serious in children and the aged than in those in middle

life. In bronchitis, massage is beneficial unless there is high fever. General massage will keep the skin active, abdominal kneading will increase elimination from the intestines. If the disease is just beginning, give educational gymnastics to increase the circulation and the activity of the skin. The only special procedures are chest percussion and prolonged chest kneading. Chronic bronchitis is not very common unless associated with *emphysema*. It may follow repeated attacks of the acute form, and it is occasionally found in rheumatic and gouty persons. The patient lives for years, the disease being better in the summer and worse in the winter. The treatment is the same as for emphysema.

Rhinitis with *coryza* is a running of the nose and eyes which extends downward through the larynx, trachea and bronchial tubes.

Asthma is characterized by dyspnoea coming on in paroxysmal attacks. The dyspnoea is due to two causes, spasmodic contraction of the bronchi or spasmodic contraction of the arteries of the lungs, both preventing a normal supply of oxygen. Asthma is usually associated with emphysema. The disease is considered a *neurosis*, which is a functional disturbance of the nervous system, hence there is no lesion. The attacks may be caused by direct irritation of the bronchial mucous membrane, or by indirect or reflex irritation, as from nasal polypi,

or from diseases of the stomach, uterus, etc. The conditions necessary for an asthmatic attack are an area of sensitive mucous membrane, abnormally sensitive nerve centres, either acquired or inherited, and some external irritant. The chest becomes enlarged but the expansion is poor. The inspirations are short and the expirations prolonged. Breathing is usually accompanied by hissing or whistling sounds, produced by occlusions in the bronchial tubes. Owing to the poor chest expansion, there is a lack of oxygen and an accumulation of CO_2 in the lungs and muscles. When this has become excessive, it produces a relaxation which temporarily ends the attack. In treating asthma give all forms of movement that expand the chest. Also give prolonged ulnar percussion applied laterally on the phrenic nerve. If the diaphragm is affected give side vibration. If possible apply these procedures during the attack.

Bronchiectasis is dilation of the walls of the bronchi. It occurs in chronic bronchitis, in fibroid pneumonia and tuberculosis of the lungs. The characteristic symptom is paroxysmal coughing with the expectoration of large quantities of mucus which may be fetid. It is attended with a hoarse breathing. The treatment is similar to that for emphysema.

Emphysema is inter-lobular or vesicular. The inter-lobular form is often diagnosed as asthma or bronchitis.

The air-spaces rupture and air escapes between the lobules. If a rupture occurs into the pleural cavity, it causes death. It is caused by violent expiratory efforts, whooping cough, or violent muscular exertions. There is no cure for this form. The vesicular form is the more common. It may be compensatory, substantial or senile. Compensatory is where part of one or both lungs is disabled and the other parts expand to compensate. The substantial form is a synonym for pulmonary emphysema. It is a condition characterized by a permanent dilatation of the alveoli with atrophy of the alveolar walls and the blood-vessels. It is found in lecturers and musicians, also in gymnasts who have inflated the lungs and performed violent exercises while holding the breath. It may be caused by hereditary weakness of the lungs or by chronic intersticial inflammation of the smaller bronchi and air cells. The elasticity of the lung tissue is decreased and there is no recoil. Secondary lesions arise from the mechanical obliteration of the pulmonary circulation. There is contraction of the small vessels, hypertrophy and dilatation of the heart, the congestion of the heart causes venous congestion of the skin and viscera. The chest becomes barrel-shaped, with the protrusion most marked in the clavicular region. There is little or no lateral expansion. A great effort produces small results. The

treatment includes general massage to increase the circulation and the activity of the skin and to prevent bronchitis; and chest percussion at expiration. As a special movement give resistive 2A adduction.

Senile emphysema sometimes called atrophic is a part of all senile changes, when the tissues lack vitality and elasticity. This is characterized by diminution in the size of the lung.

Tuberculous diseases are caused by a poison developed by the tuberculosis bacillus. These bacilli are found in all tissues except the muscular. Fifty-six per cent of the whole population of the earth are affected at some time or other by tuberculosis. Some of the most frequent locations for this disease are the lungs, the intestinal tract and the brain. A few general phenomena are common to all forms, including emaciation, loss of strength, fever and sweats. Tuberculosis may be acquired by inhalation, when some minute particles of dried sputum are taken into the lungs. Expired air is not infectious. Direct contact need not be feared, provided care is taken not to inhale germs from the sputum. The germs may also be taken through food. Milk and beef may infect with germs, causing peritoneal tuberculosis. Consumptives, as those afflicted with tuberculosis are commonly known, need not be isolated, except that they had better sleep alone. The sputum forms the

chief source of danger, but if it is destroyed while moist, there is nothing to fear. If the nurse is not predisposed to the disease, and observes cleanliness, she is exempt; weak persons with flat chests are in a condition favorable for the disease, also those who have some local weakness.

Tuberculosis of the lungs is distinguished as pulmonary tuberculosis acute and chronic, and phthisis, acute and chronic. The acute pulmonary form usually begins at the apex of one lung and spreads rapidly, tubercular tissue of low vitality forming through the lung, breaking down and forming cavities, or tuberculous infiltrations may be produced by the coalescence of neighboring tubercles which renders this affected part of the lung practically useless.

In chronic pulmonary tuberculosis, the system has the power to resist the growth of the tubercles. At intervals of several months there may be acute attacks which gradually break down the tissue. The patient may live for years. If the tubecular nodules become encapsulated, the safety of the nodule depends on the strength of the connective tissue. If this tissue is not strong enough to keep the nodule encapsulated there will be autoinfection. The nodule may become either fibrous or calcified. In either of these cases, if the area involved is small, there is no effect on the health, if large there would be

more. Some patients show a rapid progression of the disease followed by a period of health, then acute exacerbation ending in death. Patients who have a great deal of vitality may resist the disease for several years.

There is another type of this disease which develops from emphysema, chronic bronchitis or pleurisy.

Tuberculosis is sometimes called single infection because only the tubercle bacilli are found. Phthisis is due to a mixed infection, besides the tubercle bacilli, there are present pneumo-cocci and possible strepto-cocci.

Acute phthisis is sometimes known as quick or galloping consumption. It may be primary or it may follow some previous infection. It usually starts at the apex of one lung and then involves the lobes or whole of that lung. There may form yellowish nodules from fatty or cheesy degeneration, and there is usually some bronchitis. The yellowish nodules consolidate, external to this are areas of pneumonia, then there will be inflammation of the bronchial tubes. Cavities are formed through the breaking down of the nodules, tne dilatation of the bronchi from inflammation or from ulceration of the bronchioles. Acute phthisis is difficult to diagnose from pneumonia, but the duration and course of the disease show the proper diagnosis.

Chronic pulmonary phthisis may be primary or secon-

dary to pulmonary tuberculosis. The lesion resembles the acute but it is modified by longer duration.

The mode of onset varies. It may be that the first symptoms will be those of dyspnea and anemia, the latter not being relieved by treatment. Here amenorrhea is a frequent result. It may begin with gradual loss of flesh and strength and afternoon rise of temperature. Constantly recurring bronchitis in young persons is a very suspicious symptom. The disease may begin with chills and fever, or with a laryngeal cough and huskiness, or with pleurisy or hemoptysis. After the disease is developed there is pneumonia, tuberculosis and bronchitis, and symptoms of all three are present.

The treatment of all tuberculous diseases depends largely on the prophylaxis. Physical strength is a great preventive of the disease and of its continuance. If the physical strength increases, the vitality will increase and the germs may succumb. Gymnastics are an excellent prophylactic agent. Children whose family history is tuberculosis, or who have a long, narrow chest and round shoulders should be placed in the gymnasium where exercise for the development of the chest should be special. Chest percussion should be given at least once a day for a time and later twice or three times a week. When infection is present, the treatment is divided into three stages according to the amount of good

which can be obtained. There is the early stage, when the patient should be put into a gymnasium, and there should be given a few special movements for the chest, and anything in the way of general exercise which will increase the nutrition and the tenacity of the body as a whole. Give resistive movements. If the pupil is weak, give general massage, but make the treatment as gentle as possible. There must be exercise to improve the digestion and increase the skin evaporation. There must be special respiratory exercises to develop respiratory ability and to increase the elasticity of the air-cells, at first single, then resistive, and there must be chest percussion *with inspiration.* When first beginning treatment for pulmonary diseases avoid general exercises for the chest because the lungs are more or less inflamed and there is more blood in the chest than is normal, and the amount must not be increased. For the first two or three weeks, the exercises should tend to increase the peripheral circulation and thus to draw away the blood from the chest. After the peripheral circulation is well established, begin on exercises to change the shape and activity of the chest, such as shoulder blade and respiratory exercises. Chest percussion may occur two or three times in the same table and active or passive respiratory exercises may be given after every two movements. At first, make the movements extremely gentle,

then later, increase as much as the patient can endure. In the early stages, the types of movement are largely heaving-movements, shoulder-blade, balance, and respiratory movements. In the second stage of the disease patients may be made much more comfortable and life may be prolonged by exercises such as the following:

1. Rest sitt. chest perc.
2. Recl. hip circ.
3. Yd. Stp. sitt. T. ext. back.
4. Yd. sitt. 2 (usually) A circ.
5. Recl. F. flex. and ext.
6. Sitt. T rot.
7. Recl. Kn. flex. and ext. (first single, then resistive.)
8. Str. gr. st. chest perc.

Light respiratory exercises after every two.

When the patient has reached the third stage of the disease, he can only be made more comfortable. It is then too late to give respiratory exercises, as they might produce hemorrhage. The skin should be stimulated, and an attempt should be made to lessen the neurasthemic symptoms. Thus kneading will form the chief procedure and at times use such exercises as

1. Sitt. shoulder circ.
2. Fore-arm and fing. flex. and ext.
3. Recl. hip circ.
4. Recl. F. circ.

Give chest vibration after kneading of the chest. F. flex. and ext. both single and resistive may be used. Also nerve pressure along the legs. After kneading of the back give back percussion.

A good prescription to use in the early stages of the disease is as follows:

1. Stoop sitt. T. back. flex.
2. St. F. flex. and ext.
3. Kn. st. T. rst.
4. Recl. L. ext.
5. Ride sitt. T. backw, flex.
6. Yd. sitt. A circ. (sing. or double), pass. resp.
7. St. neck ext.
8. Str. gr. st. chest perc.

After every two movements give

2 A. elev. side. upw. w. resp.

These exercises are to be applied only after 2 or 3 weeks, when special movements have begun.

Disorders of Digestion.

Diseases of Digestion are Anaemia, Plethora, Gastritis, Dyspepsia, Enteritis, Jaundice, etc.

More can be done by medical gymnastics for diseases of digestion than any other form of therapy. Good digestion depends on the presence in the food of elements not present in the blood at that special time. There must be the proper speed of peristalsis, and a rapid return current from the mesentery and rapid portal circulation, and there must be enough bile to emulsify fats and regulate peristalsis.

Chronic Dyspepsia, or *Gastritis*, is also known as atrophy of the stomach. It is caused by persistent errors of diet, by debilitating diseases which reduce the nervous fibre and deteriorate the blood. The food ferments and sets up chronic inflammation.

If the patient is weak, give general massage, as the weakness is caused by reduced nerve force and anæmia Aim to bring the patient to the point where you can give gymnastic movements. Give massage to increase the circulation, to stir up the sluggish nerves, to increase general metabolism. With it give nerve pressure over the large trunks, give back percussion and sacral percussion. Knead the liver to increase the circulation of bile; knead the abdomen to increase peristalsis. Give trunk circumduction to affect the hepatic and portal circulation. Give resistive trunk rotation and abdominal exer-

cises to increase the pressure in the abdominal walls and so increase mesenteric absorption, also respiratory exercises. Give treatment every day for five or six weeks.

In *acute dyspepsia* or *acute gastritis* give practically the same things, or rely more on the movements and less on massage. The movements should be stronger. The special movements would be kneading in the pit of the stomach with the tips of the fingers; left sub-costal stomach vibration; resistive lateral trunk movements and abdominal exercises oftener than in chronic cases. Give vigorous treatment as soon as the patient can stand it, especially if his muscles are flabby. A fatty heart may complicate the case, as it is often found in dyspepsia. This must be known before giving vigorous treatment. Ask the physician to state whether there is mechanical obstruction of the pylorus. If so, leave the case alone. If there is abnormality in the contents of the stomach, treat as chronic dyspepsia, giving besides, kneading of the stomach and left sub-costal stomach vibration. If caused by impairment of muscular force, treat as acute dyspepsia. The patient is often much reduced, so he may have to begin with simple general massage. Knead the stomach, and knead the liver to increase the secretion of bile. Knead the abdomen to increase peristalsis. Give Wg. sitt. forw. flex. several times in the treatment. By this the stomach is massaged by being squeezed

between the abdominal walls and the adjacent viscera.

Gastralgia is really a functional neurosis (lesion of the nervous system). It may be a symptom of cancer or ulcer of the stomach. It is an attack of burning, tearing pain in the stomach radiating backward and around the waist. Light pressure is grateful, but firm pressure gives pain. The abdomen is contracted, sunken-in. The attacks are usually paroxysmal. In the treatment, if there are symptoms of cancer or ulcer, leave alone; if it is functional neurosis, treat as neuralgia. Then give back percussion, sub-sternal pressure and vibration resistive trunk rotation, nerve pressure on the abdomen and legs, abdominal exercises and sacral percussion. Gastralgia is common in women who are excessive tea-drinkers and usually when the general condition is below the normal. The general idea is to give procedures to help the return current. For a long time passive procedures will do more good than active. As it is a nervous trouble, the patient will recover slowly. In what is called *nervous dyspepsia*, put the patient on general gymnastics as soon as possible. If in poor general condition, begin with general massage. It is really a disease of symptoms of functional disturbance with no lesion, so we must treat the symptoms by special procedures. As there is a neurasthenic condition underlying we must change the nervous activity from sensory to motor by educational gymnastics.

As the apparatus for digestion consists of organs with mucous lining, and the power which produces digestion comes through the nerves going to the glands, through the muscular fibres by means of nerves distributed to them and to their muscular fibres in organs and glands, we find the whole action of the nervous mechanism is reflex, and we must first look at the gross condition of the organs and second consider the disease of each gland, nerve, fibre, etc. An organ may be anæmic or plethoric. Anæmia is lack of food-principles in the blood. Plethora is too much food which cannot be assimilated so it causes stagnation. Anæmia may be due to a general condition of the body or to a local condition, and this anæmia may be due primarily to a lack of nutrition coming through lack of nerve or muscular force.

Plethora may be due to a general or local condition, coming from over-feeding, lack of exercise, or lack of nerve energy. It is characterized by a reddish color of the face, a full pulse, a feeling of fullness and tension in the head, drowsiness and a tendency to nose-bleed.

In diseases of glands, over-action may be produced by inflammatory conditions or there may be lack of action produced by lack of nutrition. The glands may not do their work on account of a distinctive condition due to ulceration or cancer. There may be trouble with the

nerve, blood or lymphatic supply, or with the muscular apparatus, or there may be an atonic condition which may be local, due to lack of secretion or exercise, or general, due to some poor condition of the body. The muscular apparatus may be out of order on account of destructive causes. If there is trouble with the serous coat, it is usually inflammatory and we have what is known as peritonitis. *Enteritis* is inflammation of the intestine. It may be acute or chronic and it may involve a part or whole of the intestinal tract. It may be caused by bad food, impurities in water or toxic causes. Secondarily, it is found with gastritis, peritonitis, cancer, ulcer, chronic congestion of blood vessels, tuberculosis, Bright's disease, and usually in anæmia.

The mucous membrane is red, swollen and congested, coated with mucous, and the glands are swollen. There is a colicky pain which is worse before evacuation of the bowels. If there is a tendency to strain it indicates that the lower bowels are involved. If there is constipation it indicates that the small intestine is involved; if diarrhœa, the colon is involved.

In the chronic form, there is chronic, catarrhal inflammation of the intestines, usually both small and large, and the mucous membrane is congested and covered with grey mucous. The symptoms are like the acute form, only less severe and more protracted. There is

almost always diarrhœa as the large intestines are usually involved. The pain comes two or three hours after eating. Later there will be emaciation, prostration and anæmia. In the treatment, if the case is acute, let alone for twenty-four hours, remembering that the trouble arises from errors in diet or toxic causes. There are ptomaines in the system and diarrhœa is an effort of nature to get rid of these poisons. If the attack is severe and prolonged it shows that the poisons are very irritating and the mucous membrane is much inflamed and nature must be aided. Be very careful as there is danger of causing peritonitis. Give abdominal vibration for five minutes every half hour. This acts as a counter-irritant. An expert masseur may give Wg. stoop sitt. pas. T. rot. which will increase the flow in the inferior vena cava. Unless the masseur be skillful, it is better to let the case alone. If there is vomiting, no medical gymnastics should be given. As the patient grows stronger, the masseur may give passive hip circumduction and respiratory exercises to draw the blood away from the affected region.

In all digestive disorders, if patient is weak, give exercises in sitt. or ly. position. Use as little massage as possible. Make exercises active and give home exercises. The appetite is usually poor, there is wind, and stomach formation of acids, the food does not digest,

there is a feeling of fullness and soreness at pit of stomach, sleepiness, cold hands and feet, the patient gradually becomes debilitated and nervous symptoms finally set in.

The colloids must be transformed into crystalloids which is done in the intestinal tract. Juices must be better secreted. Increase the circulation in portal system which hastens the secretion of digestive juices. Food must be of proper kind and must be turned over on the membrane with sufficient speed to leave a new layer in contact. Anything making a more rapid passage of food from the stomach to the rectum helps digestion. Fresh layers of blood must come in contact with the membrane with sufficient speed, preventing stagnation which impedes motion, hence a rapid return current from abdomen aids digestion. General exercise stimulates circulation as a whole, consequently causes a demand for food in the tissues. Secure a good local circulation, not merely venous but arterial as well. Abdominal exercise will bring into play abdominal muscles and propels the blood more quickly through the mesenteric veins and passes the food more quickly through the intestines. Localized exercises are better than massage, and exercises causing thoracic aspiration are extremely useful because they tend to diminish stasis in the abdominal vessels. It is essential to elevate the

viscera and hence diminish the pressure that would interfere with their normal oscillation. To retain health it is necessary to have a certain definite inter-relation of position of internal organs. To restore health you must regain their juxta-position. To give internal elevation means the action of diminishing the downward pressure upon the viscera. When the chest is contracted, the capacity diminishes and there is a slight depression of internal organs of the chest and abdomen. Respiratory exercises will give this internal elevation as we can better regulate such exercises according to strength of the patient.

On account of this saving of energy muscular strength will grow very much more rapidly. Sacral percussion and strong vibration of the solar plexus gives the reaction as a diminution of activity of the solar plexus, *i. e.*, reflex irritability of the sympathetic nerves. Kneading of abdomen empties the stomach and intestines and stimulates the secretion of digestive juices, but it principally disintegrates the food. Reclining Hip circ. give as supplement to kneading (2 hip circ. is stronger) and that is usually followed by l. ext. Percussion of back acts as a tonic. Respiratory exercises, thoracic aspiration and as a finish give general gymnastics and look after diet. In dyspepsia it is better to distribute meals even if five to seven a day. Hot water should be sipped

in the morning. Eat bread less and meat more. If diet is normal, there is no such thing as indigestion. We eat too much.

Cardialgia is familiarly known as cramp of the stomach. The pain usually disappears after eating. The conditions are dependent on hyperæsthesia of the pneumogastric nerve. It is a nervous disease and the general plan of treatment is that of an extensive neuralgia—steady pressure along the main trunk of the nerve, resistive flexion of the limbs and other exercises to cultivate repose. Percussion is contra-indicated, and kneading accomplishes nothing. If there are ulcers or cancers leave alone.

Gastrectasis is the name given to dilatation of the stomach. This is caused by some mechanical obstruction of the pylorus, or the pylorus may be congenitally narrow or the obstruction may be caused by cicatricial tissue, or the condition may arise from certain abnormalities in the contents of the stomach, as it may be the result of excessive eating or drinking, or of generation of gases, or of impairment of the muscular force. The symptoms are the same as those of chronic gastritis and there is a peculiar form of vomiting with heart-burn, acid eructations, pain and a sense of oppression. The bowels become constipated from lack of faeces in the intestines. There is no absorption, consequently there

is a loss of flesh and strength. When there is a lack of nutrition there is apt to be painful cramp. If there is mechanical obstruction of the pylorus, do not attempt treatment. If due to abnormality in the contents of the stomach, treat as chronic dyspepsia, giving also kneading of the stomach and left sub-costal stomach vibration. If caused by impairment of muscular force treat as acute dyspepsia. As the patient is often much reduced, it may then be well to begin with general massage. Knead the stomach and liver to increase the secretion of bile and knead the abdomen to increase peristalsis. Give Wg. sitt. forw. flex. several times in the treatment, as by this the stomach is masséed by being squeezed between the abdominal walls and the adjacent viscera.

Enteralgia means colic or cramp. It may be a neurosis or it may come from acute enteritis. If a neurosis, treat the underlying cause—neurasthenia. If there are symptoms of acute enteritis treat that. Also give these special movements: Stoop st. abd. massage, arms hanging relaxed, Sub-sternal vibration, Act. T. circ. (or Act. hip circ.), Resp. exercises.

Intestinal Obstruction may result from one of several causes, first, internal strangulation; second, inter-susception; third, volvulus; fourth, stricture and tumors: fifth, foreign bodies which may be gall-stones or most common and most important, faecal accumulations. Strictures

and tumors seldom produce a complete obstruction. Cardinal symptoms of all intestinal obstructions are pain, vomiting and constipation. The pain is colicky and intermittent at first, then general. It is first localized over the obstruction and then spreads over the entire abdominal surface. Vomiting is first gastric, then bilious, then stercoraceous. Constipation is usually preceded by emptying of the bowels below the obstruction. The obstruction should first be removed by a physician. There must be no massage until this has been done since massage would increase peristalsis and aggravate the trouble. After a reasonable time has elapsed, the patient may be given abdominal massage and abdominal exercises, principally as prophylactic measures.

Constipation is a symptom rather than a disease. Give well-regulated gymnastics of not too violent a nature as a daily routine. If the patient be weak or indolent it is well to give general massage. Give abdominal massage, with transverse and rotary kneading along the colon and vibration of the abdomen. For movements, give resistive hip ext., Single and double hip circ. (double circ. affects the vena cava, the single affects lower vessels.) Between treatments give abdominal exercises, lat. T. movements and respiratory exercises to use at home. Constipation can always be cured, though if paralysis be present it is a long and tedious process. In this case

there must be an increase in the general activity and irritability of the motor nerves.

Prolapsus of the rectum. The lower part of the rectum comes down through the anus. It is excoriated and very sensitive. The cause of this trouble is weakness of muscles. It is found usually in children. Give Prone ly. pelv. elev. with sacral percussion, Inclin. stoopfall pos. with some L. elev., Percussion of the back (ulnar and palmar) and of the sacrum. This treatment should be given two or three times a day.

Hemorrhoids are produced by whatever causes pelvic congestion. Hemorrhoidal veins have no valves, and anything which tends to retard the venous flow will produce the disease. The veins are varicose. The walls being thin, the backward pressure forces the wall outward, and tumors form. These are called external hemorrhoids or piles if they are on the outside. If found inside the rectum, the capillaries are more affected than the veins, becoming engorged until they rupture, which causes internal hemorrhoids or bleeding piles. Hemorrhoids may occur with external hemorrhoids. In the treatment first find the cause and attack that, then give specific exercises. Give any exercise which hastens the return current, then 1, Sacral percussion; 2, Pass. Ft. circ.; 3, Rest Kn. st. T rst.; 4, Reach ly. 2 A. elev.; 5, Str. gr. st. conc. hip flex. (latter with resistance);

6, Sacral percussion; 7, Cr. ly. 2 Kn. abd. and 1 add. (later with resistance); 8, Rest recl. T circ. and 9, a respiratory exercise.

Bile is secreted by the liver cells from materials found in the blood, excreted by the larger bile ducts and gall ducts, carried to the duodenum by the hepatic ducts, or, if no digestion is going on, it is carried back to the gall-bladder by the cystic duct. There may be obstructions in these various ducts or in the duodenum. This condition will produce *jaundice.* There are two varieties, classified according to cause—*obstructive* (hepatogenous) and *non-obstructive* (hæmatogenous). Obstructive may arise from foreign bodies in the cystic duct, gall stones, or from parasites, or there may be substances entering from the duodenum and inspissated bile (made thick by absorption of water, leaving the salts). We may also have obstruction from catarrhal inflammation of bile passages or duodenum, strictures or obliteration of the ductus communis, or we may have pressure from without on the larger ducts, or an enlarged gland in the hilum of the liver, or there may be neighboring tumors in the stomach, liver, or pancreas (causing pressure on the ducts) aneurism, tumor formed from fæcal impaction, or there may be peritoneal bands, caused by inflammation and these press on the ducts.

Non-obstructive jaundice may arise from wide spread

necrosis of the liver cells or from toxic causes (yellow fever, typhoid fever, from the use of mercury, phosphorus, ether, chloroform, etc.). A jaundiced person has first a yellow or brownish tinge in the conjunctiva, then in the urine, which foams readily. A yellow skin need not necessarily be caused by jaundice, though a jaundiced person always has a yellow skin. Even the perspiration becomes bile-stained and there are digestive disturbances, and a loss of flesh and strength. There is no assimilation of fats, there is anemia, the pulse is slow, and in severe cases, there is a tendency to hemorrhage. There is usually headache and irritability, while in severe cases there may be convulsions, stupor, or coma. In non-obstructive jaundice, the conjunctiva, urine and skin are discolored (though the color is lighter than in obstructive jaundice), the bile enters the intestines but does not change the character of the stools, as in obstructive when the stools are pasty and clay-colored. In severe cases the cerebral symptoms appear.

Fatty Liver, either fatty infiltration or fatty degeneration. Fatty infiltration is physiological at certain times, after a hearty meal and during lactation; with persons addicted to a diet of rich food it may become pathological. Fatty degeneration begins at the periphery of the cell; it is found with diseases like phthisis, anemia, in phosphorus poisoning, yellow fever, and acute yellow

atrophy. The liver is very much enlarged, the specific gravity becoming so lowered that it would float in water. If a section were to be cut, the knife would be greasy and smeared with fat. This may cause disturbances in the functional activity with a sense of weight and fullness and symptoms of hypochondria. There may be partial obstruction, but a marked jaundice-pain, or tenderness are absent. Occasionally there is acute gastritis with marked cerebral symptoms and weak heart. Should the patient vomit blood, the disease will usually end in death. Prognosis of recovery is bad, though the patient, as an invalid, may live a number of years.

As to the treatment for diseases of the liver, perhaps the most sensible advice is "Do n't touch!" Where jaundice is obstructive nothing can be done until the obstruction has been removed and then you can only give light educational gymnastics and after a time percussion of the liver. A functional trouble of the liver may also be treated in the same way. Non-obstructive jaundice must be let alone, as massage increases the circulation and aggravates the conditions already existing. If a jaundiced person is convalescent abdominal kneading may be given to relieve constipation and other attendant evils.

Disorders of Neurition.

Diseases of the nervous system are classified as diseases of the periphery and diseases of the centre; they may also be classified as functional and organic. A functional disease may be cured. An organic disease, if found in peripheral parts, may be cured; otherwise, not. Nervous energy is expended in three directions, through sensory, motor, and sympathetic nerves. These are developed proportionately to their use, and are atrophied proportionately to their lack of use, or to abuse. If one set becomes highly developed, its irritability acute, the other sets proportionately diminish in functional activity. In this manner, one set of nerves may form a derivative channel for the other sets. ("Derivative" means something that leads off from something else. Medicines which lessen local blood-pressure are called derivatives.) There should be equilibrium between the sensory and motor nerves. There should be proportion between mental and physical activity.

The diseases of the nervous system are neurasthenia, neuritis, neuralgia, cephalalgia, paralysis, chorea, epilepsy, locomotor ataxia, progressive muscular atrophy, and hysteria.

Neurasthenia, or nervous prostration, is a disease peculiar to those who lead lives of worry and hurry, of whom the American is a conspicuous example. This disease may come from overuse of either motor or sensory nerves. It may be looked for in those of nervous as well as those of phlegmatic temperament. The patient is tired, morbid, irritable, disagreeable, full of whims and crochets. Such a person is not necessarily an invalid; indeed, he is apt to be capable of an unusual amount of work.

To be nervous, from a pathological point of view, means that the nerves are worn out, in other words, there is nerve-exhaustion; while from a simple physiological standpoint, to be of nervous temperament means that the nerves are highly sensitive and can receive impressions very readily. Here the superfluous energy needs to be worked off.

Neurasthenia begins with fatigue. The patient feels tired in the morning, then all the morning, then all the time. The back particularly feels tired. Reflexly, the genito-urinary system in women and the digestive system in men are early affected. If this is the case, there is in women a sacral or lumbar-sacral backache. Sometimes, however, the backache begins between the shoulder-blades and travels downwards. Next, he can not sleep, and a variety of symptoms appear. The

hands and feet are cold, neuralgic pains are felt in the head and body, hysteria may be present — oftener in women. Reflexes into the sympathetic and motor systems cause disturbances of the circulatory and digestive functions (such as "nervous dyspepsia," constipation, etc.), the muscles often atrophy, palpitation of the heart may occur — an entirely functional disturbance.

When assimilation and elimination are poor, the patient becomes emaciated, but emaciation does not always accompany the disease. There is usually a general wearing-out of the nervous tissue; hyperæsthesia (over-irritability) of sensory nerves gradually turns to anæsthesia (lack of sensation). After a time there is inability to discern fatigue, — the patient is tired all the time, day and night, and the fatigue becomes monotonous and normal. He does not know that he is tired until once in a while he has a well day, and then he begins to realize that he is sick.

A common cause of neurasthenia is overuse of the sensory nerves. Overuse of muscles may produce it, though this is rare.

Insanity may be developed from overwork of sensory centres. It is the extreme result of neurasthenia.

Besides the real neurasthenia, there are two types that are not exactly pathological. For instance, a patient's mind may be affected, and he thinks he is sick.

He imagines this and that, and cultivates a languid manner. This state may be cured in a short time by "mental science" or by hypnotism. Again, some persons are born neurasthenics. It is an inheritance. The men of their family have continually exhausted their nervous energy, and the women have had no physiques to speak of, and have taken no pains to cultivate what they had not. What can be expected from such ancestors but neurasthenic children? They are born tired, and they live and die tired. They can only be made a little more comfortable.

Neurasthenia may be said to be the outcome of either spinal or cerebral exhaustion. In spinal exhaustion, massage is indicated. In cerebral exhaustion, exercise is indicated. Spinal exhaustion is largely a disturbance of locomotion, and is characterized by general inco-ordination. Cerebral exhaustion has other symptoms. It is necessary to study carefully into the history of the case. A patient's previous occupation will influence the diagnosis as spinal or cerebral. Ordinary cases are from cerebral exhaustion.

In the treatment remove the cause if you can. Have the patient stop work or change it entirely.* As the dis-

*Rest alone will not accomplish much, though Dr. Weir Mitchell has had success in his special treatment, which consists of almost entire inactivity (the patient being put to bed), accompanied by a process of overfeeding, followed by massage, electricity, and simple movements similar in effect to exercises of medical gymnastics.

ease varies with every new subject, the treatment must be made to fit the case. Aim at making the patient use his ability to control his motive power. Try to reproduce the equilibrium between the sensory and motor nerves. Improve the general functional activity by general massage and resistive movements, making a progression from these to general active exercise. As a general thing, the first treatment should consist entirely of passive movements; but it should be remembered that they do not develop force, even though they increase the endurance. They may remove fatigue periodically, and lengthen the possible period of activity, but there will be no increase or new growth of force to replace that used up. Massage and passive movements are only introductory measures, leading to active, and especially resistive, movements; for by the latter the motor nerves are more quickly strengthened, which will necessarily affect volition so that gradually the consciousness of force will replace the consciousness of fatigue.

Massage of the back is early employed, as there is congestion, produced by the excessive activity of the central parts of the cerebro-spinal system, which has caused an extraordinary afflux to those parts. To relieve this congestion, use gentle kneading and percussion, applied alternately, and exercises in hanging position; also massage of the head, and circumduction. Let the rest of

the treatment aim at obliterating other symptoms. Too long a treatment will increase the congestion. Friction should not be used, as it increases the sensory irritation. Resistive movements should follow assistive movements.

Neurasthenia is sometimes the outcome of other diseases. Insomnia is usually a symptom. There may be too much or too little blood in the brain: if the former, give slow leg movements; if the latter, give exercises which, by centrifugal force, send the blood into the brain and head. Use resistive movements of the head. The treatment is usually given just before bedtime. If, however, the patient sleeps well, it is better that he take his treatment in the morning, lest its effect tends to make him wakeful. Ordinarily, it is well for the patient to move about after the treatment, to increase the circulation and to assist the assimilation of the movements. Ten minutes massage of the back is the utmost limit for a neurasthenic; five minutes is usually enough. If he feels better the day after than the day of treatment, give the prescription every other day. This refers to cases of long standing or in the aged, when reaction is slower. Where the patient is young and the reaction rapid, provided the case is recent, give treatment every day. Generally speaking, the treatment should be repeated so often that the effect of one application has not disappeared when the next is given. After a time, change to

every other day, including Sundays; then every three or four days, until finally give regular treatment only once a week, filling the interval with easy exercises for home practice. If the patient cannot endure ordinary massage or any curvilinear movement, give hard massage, which has the effect of pressure and will produce temporary anæsthesia.

Specimen prescription for neurasthenia, with pelvic congestion, neuralgia of the head, dysentery, pectoral chest contracted, etc., etc.

{ Back perc. (st.)
{ Reclin. pass. F. circ.

{ Str. ly. 2 L. circ.
{ Str. reclin. res. 2 A. flex.

{ Wg. sitt. resis. T. rot.
{ Reclin. ly. 2 A. elev. (resp.)

{ Kneading of back.
{ Reclin. resis. Ft. flex. and ext.

{ Abdominal vibration.
{ Reclin. T. circ.

{ Sacral perc.
{ Percussion and vibr. of H.

Neuralgia. The word "neuralgia" means simply nerve-pain. In a sense any pain is neuralgia; when spread over a large surface the pain is called myalgia. The pain may be of central origin, originating in the cells, or

it may be dependent on change of vibration in the axis cylinder, or it may be from a congestion of the neurilemma or a thickening of the adjacent tissues. The pain is well defined, but occasionally dull and heavy. It can be traced to definite causes. It is often the outcome of a cold or an old sprain or traumatism; sometimes it is the after-effect of general anæmia, malaria, rheumatism, or nerve-exhaustion; in short, of anything that lowers the general vitality. It is accompanied by disturbances of the circulation, a slow venous circulation, and the congestion of small vessels. It is difficult to distinguish between neuralgia and neuritis, and probably the latter is often followed by the former. The best authorities say that there is a distinct difference between them.

The symptoms are pains, spontaneous and paroxysmal, felt in the region of the nerve distribution, rarely constant; there is usually some sensitiveness, especially where a nerve exits. A common form, especially in women, is intercostal neuralgia.

Massage is very beneficial in many cases. It may heighten the general metabolism and so increase the vitality and the destruction and excretion of waste material, or the distinct procedures may stop the vibration of the axis cylinder and re-establish a new normal rate. If the pain is sharp and shooting, pressure is indicated,

because it benumbs the nerve and stops the vibration. Give as near the point of exit as possible, and make it continuous pressure. Follow along the main trunk of the nerve involved. If the ache is dull and continuous give rapid percussion from centre to periphery for a long period at a time. Alternate this with kneading. The percussion produces a congestion of the superficial vessels which the kneading relieves. In either case you may give kneading and passive circumduction, extension, etc. If the general condition of the patient is poor, general massage is indicated. Do not fear to hurt too much in this treatment; as a rule, light pressure is more painful than heavy, and the latter is anæsthetic. Practise the movement which hurts most. If the pain is caused by acute inflammation massage is contra-indicated, because if pus were present there would be danger of septicæmia, and in any case the symptoms would be aggravated. In myalgia where neuralgia co-exists with rheumatism give about the same treatment as first described, using rather more kneading and less percussion. Give resistive movements, especially those that hurt. Use palmar percussion especially, and use ulnar or digital with localized neuralgia.

The most persistent form of this disease is sciatic neuralgia. For this give passive extension, passive foot and hip flexion. In obstinate cases give deep friction

(using vaseline) along the affected nerve. Use the knuckles. Fasciæ may thicken and the nerves knot up; for this, deep friction is the only procedure. If this be the outcome of malaria or general constitutional disease give a little general massage. An ordinary case of neuralgia when of not too long standing may be cured in a week, by local massage, applied about fifteen minutes each day.

Neuritis, — inflammation of a nerve. According to most authorities, in neuritis massage is contra-indicated, but it has been used with a moderate degree of success. Neuritis differs from neuralgia in that the pain is constant and is spread over a larger surface. The inflammation may involve one nerve or a group, in which case it is *simple neuritis;* or it may involve nerves all over the body, in which case it is *multiple. Toxic neuritis* is the outcome of alcoholic poisoning, of poisoning by arsenic, lead, or malaria. *Infected neuritis* comes from pyogenic micro-organisms, infectious fevers, syphilis, tuberculosis, diphtheria. The most common cause is an injury to the nerve, compression, tearing, stretching. The next common cause of single neuritis is lead-poisoning.

In single neuritis the inflammation is usually perineuritic. There is hyperæmia and sometimes exudations of blood, with migration of leucocytes into the neuri-

lemma. If severe the axis cylinder is totally destroyed, but this form is rare, as simple neuritis is usually curable. The inflammation is common in the white substance of Schwann, the neurilemma or connective tissue; if it attack the axis cylinder the latter is destroyed in spots. Multiple neuritis is most commonly caused by alcoholism; next, by diphtheria. It occurs oftenest in women, and between the ages of puberty and fifty. It is an inflammatory and degenerative affection, attacking a number of nerve-trunks simultaneously or in succession. It is characterized chiefly by wasting of the tissues, and painful paralysis, or by ataxia, with some motor weakness. It may take one of two forms: it may be pre-eminently motor and paralytic or ataxic and sensory.

Neuritis usually begins slowly with sensory symptoms, affects the legs and feet first, especially the extensors (of toes) and flexors of feet, and produces foot-drop. If it ascends it skips the hip and trunk and attacks the arms, when the extensors are affected and there is wrist-drop. Usually there is a great amount of muscular atrophy. As a rule, it begins as an acute disease, with a course of several weeks; it then becomes chronic and continues for a long time, with doubtful prognosis of recovery. The pain is sharp, like the pricking of pins and needles, and is constant. In neuritis of the sciatic nerve there is a prickly sensation, while in sciatic neuralgia it is either a tearing pain or a dull ache.

Massage cannot be given while there is acute inflammation, as it would be too painful and it would increase the inflammation. Give gentle kneading and passive circumduction, and avoid the large nerve trunks. If there is more or less cramp give passive extensions. In acute forms avoid nerve pressure or percussion. In chronic forms give both.

Paralysis — inaction of nerve, causing a loss of motion or of sensation. Paralysis may be of central or peripheral origin. It may be caused by functional disturbance or by hemorrhage in the brain. Paralysis is of central origin when due to some disturbance of the spinal cord or the brain; it is peripheral when due to injury of a nerve or to some local disturbance. Paralysis of central origin cannot be absolutely cured, but it may be helped, especially if the patient is young. Peripheral may often be cured.

Neuroses of central origin are *chorea*, *epilepsy*, *infantile paralysis*, *progressive muscular atrophy*, *hysteria*, and *locomotor ataxia*. In infantile paralysis and locomotor ataxia the disturbance is principally in the spinal cord.

Chorea, or St. Vitus's Dance, is characterized by jerky, spasmodic, inco-ordinated movements. The facial muscles are contorted upon the slightest irritation. It is a disturbance of the brain, and usually has its seat in the cerebellum. It occurs almost entirely in children from five to fifteen years of age. It is found oftener in girls;

it is most noticeable in the spring; it is more frequent in cities. Chorea is muscular insanity. It often appears in the second generation. The spasmodic, inco-ordinate movements occur either when the muscles are at rest or only during volitional movements; or there may be a mixed type. The movements usually cease during sleep.

At best, the etiology is vague. The causes generally stated are rheumatism, mental worry, injury, or fright. In about twenty-five per cent of the cases endocarditis is developed. At about the age of puberty overstudy and worry over lessons or examinations are potent causes of chorea. Pregnancy may be a cause. It usually develops slowly, with irregular twitchings of the hands or face. The mind is usually dull and the child irritable. The appetite is poor; there is constipation and more or less anæmia. Any excitement or physical exertion causes an aggravation of the symptoms. The muscles are weak, but not usually paralyzed. The disease usually lasts from ten to twelve weeks, but it may continue for months. It must be diagnosed from a convulsive *tic*.

Tic involves one muscle or a group of muscles. Chorea is a general convulsive movement. Males are more often affected with tic than females. Tic is not so amenable to treatment as chorea, and it usually lasts much longer. Tic does not imply heart-disease or rheumatism. It has been recently claimed that chorea is due to infection.

Not much is absolutely known about it, though hereditary influences probably have some effect. In all probability it is a low grade of inflammation.

Massage alone will accomplish little in chorea. Rest, massage (passive movements), and an abundance of easily digested food are indicated, but gymnastics will accomplish the best results, if not given too early. When the child becomes less excitable and less discouraged, begin with simple gymnastic movements requiring co-ordination. As chorea is a motor inco-ordination, gymnastics will counteract the cause and develop repose of motion. It must be remembered that the child is easily tired, and it is advisable to finish the treatment with massage and percussion of the back.

Epilepsy is a chronic functional neurosis attended with periodical seizures characterized by loss of consciousness and convulsions. Sometimes mental disturbances take the place of the convulsions. Age of patient is commonly from ten to twenty years. Heredity is supposed to be the chief cause. Pathological changes are most often found in the cerebral hemispheres and cortical cells. There is usually a decided lack of bodily development, proportions are poor, the head is usually large, the sexual organs are under-developed. An acute attack of convulsions is not epilepsy, but *eclampsia.* Other forms are *grand mal*, *petit mal* and *Jacksonian epilepsy. Grand*

mal is a severe attack, *petit mal* a slight seizure with no unconsciousness. In *Jacksonian*, the prognosis is bad. There may be one muscle affected or a group. Consciousness is not usually lost.

Heredity through alcoholism and syphilis in parents is the most common cause. It is found in the well-to-do classes. It rarely appears after the age of twenty. There is general mental deterioration in the majority of cases. The attacks are supposed to be due to a sudden discharge of nerve force from motor areas of the cortex.

Epilepsy shortens life, the patient rarely living to be over forty; ten per cent become insane, and from five to ten per cent recover. In treating epilepsy, if the general health is improved there is less liability to the attacks. Thus both massage and gymnastics may be used to advantage. Give easy gymnastic exercises, usually ending with massage and percussion of the back. Running, jumping, and vaulting had better be eliminated; also all elements of competition, or anything which will cause excitement.

Infantile paralysis or *anterior poliomyelitis* is a disease of the spinal cord characterized by motor paralysis of rapid onset, followed by wasting of the muscles without sensory symptoms. It may occur at all ages, but it is most common in infancy, and thus has been called infantile paralysis. It is usually found in children between the

ages of two and five; it attacks the robust and the weak, and occurs about equally in boys and girls. Age, the season of the year, and infectious diseases are the most important etiological factors.

The lesion is characterized by degeneration of anterior motor cells of the cord, and usually of the lumbar and cervical enlargements. The anterior cells usually preside over the nutrition of the muscles, and there is a wasting of tissue. The lesion is usually bilateral and affects groups of cells functionally associated (flexors or extensors). The legs are most often affected.

It begins abruptly with rise of temperature, sometimes accompanied by convulsions. The greatest degree of paralysis is reached at the onset; improvement always takes place afterward. The muscles become flabby and wasted; all reflexes are absent; the skin is cold and bluish. The child may not be able to move his legs or arms; the parts are sensitive to the touch. The paralysis rapidly reaches its height, remains stationary for a time, then improvement sets in, and reaches a certain point and then stops. On account of this we may divide the progress into stages; viz., first, stage of invasion (few hours usually); second, stationary period (usually from one to six weeks); third, stage of improvement (from six months to one or two years); fourth, chronic stage.

Improvement always begins in the part least affected.

In the chronic stage the temperature of affected parts is lowered several degrees, the skin has a reddish-purple, mottled look, the bones as well as the muscles of the affected parts have a limited growth, so that deformity follows. Deformity also arises from contractures of opposing muscles. The most common deformities are *talipes equinus*, a kind of club-foot, where the heel is elongated and the weight thrown upon the toes, *talipes valgus*, in which the foot is everted, *talipes varus*, in which the foot is bent inward. There is sometimes a deformity of the knee, or there may be a lateral curvature. In recovery the patient usually acquires the use of all the limbs except one leg. This produces a limp. The muscles atrophy in the short leg.

This disease will require an extended period of treatment. There should be nothing attempted until the stage of improvement has begun, then give gentle kneading and ulnar percussion on the affected muscles, and lead up to resistive movements. Find what motions are difficult for the patient and train the muscles to do these movements, gradually making new cell areas develop the functions of those diseased. Even though the treatment continue for several years, the improvement is sometimes only temporary. Nevertheless, a child afflicted with paralysis should have medical gymnastics all the time, or the disease may increase until he becomes a cripple.

Locomotor ataxia is also known as *tabes dorsalis* or simply *tabes*. This is a chronic, progressive disease of the spinal cord and peripheral nerves, characterized clinically by inco-ordination, pain, anæsthesia, and various visceral and trophic disturbances. It occurs in men much oftener than in women, and usually appears between the ages of thirty and fifty years. The great predisposing cause is *syphilis*. Another cause is exposure to wet and cold, combined with great exertion.

It is a hardening of fibres in the posterior columns of the cord, outer part of the column of Goll, and inner part of the column of Burdach. The spinal cord is reduced in size; pia mater is usually thickened; nerve tissue is replaced in these parts by connective tissue. The upper lumbar and lower dorsal region are first affected, then the disease spreads upward and laterally, and we may find lateral sclerosis of the cord.

The pain is usually paroxysmal, known as lightning pains; there is a sensation of numbness, also a tingling or feeling as of ants crawling under the skin; there is a sensation in the feet as if the patient were walking on wool or feathers. There is a loss of patella reflex, and various other symptoms.

In the first stages of the disease there is a slight uncertainty in the walk, especially at night and when the eyes are closed. There is numbness in the feet, darting

pains in the legs and rectum, temporary attacks of vertigo from the effort of co-ordination. There is a sense of uneasiness, then absence of the patella reflex. This stage lasts from several months to years, while the gait gradually changes to the characteristic gait of locomotor ataxia, — a rolling gait.

As the disease progresses the gait becomes so unsteady that if the patient closes his eyes he is liable to totter and fall. He can do anything that he can see that he is doing, but he has lost the sense of touch; he has no sense of weight. The feeling as of wool on the soles of the feet increases. Then comes a tightness around the waist, known as girdle pain. The bladder becomes weak, with consequent incontinence, because the bladder centre is in the posterior lumbar region of the cord. The bowels become affected. A symptom known as Robertson's pupil now appears, and it is found in only one other disease; viz., *paresis*. This symptom is absolutely diagnostic of the disease. During the years in which these symptoms are developing there may be times of temporary improvement. In the last stage the patient loses all power of walking, the legs become wasted, though the muscular strength holds good. The lateral portions of the cord are affected as well as the posterior. The patient is unable to put food in his mouth, and loses all ability of co-ordinating movements. Although paraly-

sis affects the bladder and the rectum, and although the bones and ligaments become softened until one part after another virtually dies, yet the intelligence holds good, and the patient may continue to live for many years. It is peculiar that in women the symptoms of inco-ordination begin in the arms rather than in the legs.

This disease is incurable, but by improving the general nutrition many symptoms may be prevented from progressing, and by gymnastics a new set of movements may be developed, thus artificially supplying those functions which have been destroyed. General massage will retard the disease. Single and assistive movements may be used, and as the patient is taught to do them the operator may give resistance. Try to teach new movements which may take the place of the old ones. Try to prevent discouragement, which is a potent cause of helplessness. Give movements with support which will encourage the patient. At first improvement is rapid. It is best to give treatment for two or three weeks and then stop for a time, perhaps two weeks; then begin again. Treatment should be given at least every other day, or it will have little effect. It is most satisfactory if given every day. It is said that a constant jarring of the spine, as in bicycle riding, will produce locomotor ataxia.

Progressive muscular atrophy, or *wasting palsy*, in its progression resembles locomotor ataxia. It is a chronic

disease, characterized by progressive wasting of individual muscles, or groups of muscles, and by an associated and proportional amount of paralysis. It is found most often in men between twenty-five and forty-five years. It is caused by excessive muscular exertion, mental worry, exposure to wet and cold, by syphilis, and by lead-poisoning. In the chord the anterior nerve-roots are undergoing atrophy. The disease is practically confined to the anterior roots. The muscles are wasted, pale and shrunken; sometimes the sarcolemma is absolutely empty. Atrophy spreads from muscle to muscle, and usually spreads upward, the right hand being the part first attacked. In the early stages the affected parts feel weak, or have rheumatic pains. Then atrophy begins. The disease gradually spreads from the hands to the flexors and extensors of the forearm, then to the arm and shoulder. In from three to nine months the other arm is affected. There is a type in which the deltoid, triceps, biceps, etc., are affected first, called "upper-arm type," and the disease spreads downward. In any type the disease spreads until all parts are affected. A rare type begins in the legs. It usually progresses steadily until it reaches an advanced form, then its progress may be arrested for a short time. Progressive muscular atrophy may last from two to thirty years, the patient becoming more and more helpless, until finally the extreme limit is

reached. The bodily health is affected by the destruction of the muscle. The muscles are the feeders and scavengers of the body, and in proportion as the bulk of muscle decreases the health diminishes. Death usually results from the involving of the respiratory muscles.

A description of the lesion would begin with degeneration, then atrophy of the anterior motor cells of the spinal column, degeneration of the lateral columns, then degeneration and atrophy of the anterior roots, then of the peripheral nerves, then of the muscles. The muscular fibres are narrowed and shrunken, the capillaries and small blood-vessels are dilated, and sometimes connective tissue takes the place of the muscular and there may be no apparent atrophy.

Nothing can cure this disease, but the patient can be made more comfortable by stimulating the functions which are inadequate. No active movement should be given.

Occupation neuroses (*peripheral paralysis*) are certain localized motor affections in bookkeepers, telegraphers, violin-players, etc. The most common is *writers' cramp*. Cigarette-rolling may be a cause; piano-playing sometimes. Men are most often attacked. The symptoms are pain and local spasms. There may be local fatigue most of the time, but usually the symptoms only appear when the patient is engaged in the occupation which produces them. There is considerable pain, also spasmodic con-

tractures and tremor. The pain may finally extend over the whole limb. The same muscles can be used perfectly for all other movements.

Writers' cramp is a disease of the last century, and especially since 1820 (when steel pens were introduced). It rarely appears after the age of fifty. The style of writing is a factor, especially the cramped style where there is limited motion in the wrist; free-arm motion seldom produces it. The old-fashioned way of holding the pen tends to produce it. Authors seldom have it. The symptoms rarely come on suddenly. The attack is insidious; the hand gets fatigued more and more easily and makes inco-ordinated movements. The extensors of the fingers are usually affected. Patients are very often nervous individuals, and the disease is sometimes purely mental. The actual disease is chronic, with a rather unfavorable prognosis, but there are chances of recovery if the case is taken in time. It is well to suggest a change in the style of writing, or, better, to learn to write with the other hand. Best of all is a change of occupation.

In the treatment find which nerves and muscles are affected and give local treatment, leaving the others alone. Overdevelop the antagonists to the affected muscles so they will steady them. Diminish the neurition to the parts by pressure. Give also prolonged trans-

verse percussion and resis. flex. and ext., as the case requires. If it goes on for any length of time the lesion usually goes up the arm into the seratus magnus, and by reflex action often to the seratus magnus of the opposite side. In the treatment begin at the central end, the brachial plexus, give pressure, resistive movements of the whole arm, extension of the wrist and fingers, and abduction of the fingers. For home exercise use abduction with rubber bands.

Typewriters' cramp is a more serious form of the disease and leads to articular rheumatism. Treat as in writers' cramp, using the rubber bands to strengthen the extensors of the fingers. Some physicians have used in such cases a machine made in the shape of an iron hand, which fits the hand and fingers closely, and renders it necessary to use the arm instead of the fingers for the movements of writing. The disease may be prevented from increasing if massage be used at an early stage.

Hysteria is a chronic functional nervous disorder. It is essentially a psychosis. There is an absolute pathological basis underlying the disease, though it is not clearly defined. There are two forms, *hysteria major* and *hysteria minor*. Both are characterized by crises of emotional or convulsive nature and an interparoxysmal state in which certain stigmata are present. It is often almost impossible to diagnose it from insanity or epilepsy, but

the difference is that they are incurable, while hysteria is essentially curable.

The predisposing cause is almost always heredity. In seventy-five per cent of cases will be found a nervous family history, and it is transmitted oftenest by the mother. It is usually a disease of early adult life (the hysterical age is between the ages of fifteen and twenty-five years), but it has been noted in children of three years. The cause in young children is heredity, insanity, certain anæmic, exhaustive, and wasting diseases. Defective or imitative education is a large factor. Females are oftener affected than males. Male hysteria is common in the very poor. The older the country the more prone to hysteria. Southern races are more prone to it than northern. It is common among negroes. It is often due to bad methods of education and bad family training. The most important single exciting cause is some powerful emotion, particularly fear, excitement, etc. Injuries plus mental shock are fruitful causes. Syphilis, lead-poisoning, alcoholism, tobacco, sexual excesses, are all powerful factors producing it.

The lesion presents no known anatomical changes. It is a brain-disease affecting primarily the cortex; secondarily, lower centers are affected. It has been said to be a benumbing of associated inhibitory tracts of the brain so that sensations are dammed up until they prom-

iscuously overflow. One writer describes it as "a field of consciousness narrowed but exalted in intensity."

The symptoms of hysteria major and minor differ in degree more than in kind. In minor, there is interparoxysmal condition of emotional weakness, nervousness, and hyperasthesia, but no stigmata. Stigmata of major are anæsthesia, paralyses, and convulsive contractures. Hysteria minor is usually found in young girls and children who complain of nervousness, lack of control, who laugh and cry easily, sleep badly, complain of headaches, and almost always present the "ball in the throat." Crises are purely emotional. Patient has paroxysms of laughing and crying, or one alone. This state may amount almost to insanity, and in both kinds is usually accompanied by a copious discharge of limpid urine. It is very closely allied to neurasthenia, and usually disappears as womanhood comes on, if the conditions are healthful. The treatment is strict but kind. Never give in to the patient's feelings; be especially stern when times of laughing and crying come on.

Hysteria major requires a very skilful diagnosis. The symptoms take every shape and form. Between the attacks there may be stigmata, anæsthesia, paralyses, contractures, tremors, and peculiar mental symptoms. The paroxysms are emotional and convulsive. The emotional are characterized by violent outbursts of laughing and crying,

attacks of furious anger, all without cause. The convulsive seizures come on under the influence of some excitement, slight injury, or gastric disturbance, and the patient falls, kicking and rolling from side to side, while the hands, arms, and fingers are flexed, the legs and feet extended. There is usually some lessening of sensation over the body, but the patient will never hurt herself, under any circumstances. A hysterical patient may be blind, deaf, or dumb; there may be a disturbance of the taste and always a limitation of the field of vision.

Traumatic hysteria is a curious form. The injury is very real to the patient, but there is absolutely no organic lesion.

Another peculiar form is *hysterical syngultus* (hiccough), in which certain vaso-motor disturbances are common; the limbs or other portions of the body are cold and bluish in color — a very peculiar color. The hand is usually much swollen and the fluid can be felt. These crises are followed by a large discharge of limpid urine of very low specific gravity.

The mental state of all those afflicted with hysteria is characteristic. The minds are not dull, but there is an emotional, intense craving for sympathy, with weakness of will and lack of self-control. The mental activity seems to be confined to personal feelings; the patient cannot reason, but acts on the spur of the moment. He is in a

suggestive state, and obeys very easily the influence of another's will. There is usually more or less anæmia and constipation.

In treating hysteria use educational gymnastics as much as possible, taking care that no harm comes to the patient. (Do not allow vaulting or climbing to any height, as an attack might appear unexpectedly and the patient would fall.) General massage will improve the condition of the patient's health, but will affect the disease only indirectly.

Epilepsy is a chronic nervous affection characterized by sudden loss of consciousness, with general convulsions, the paroxysms lasting but a short time. The patient's face is pale, he utters a peculiar cry and falls unconscious. For a moment the whole body is rigid, then the face becomes congested and the convulsions begin. The tongue is often bitten, and a bloody froth is ejected from the mouth; the eyes are rolled upward. The patient should be laid flat on his back and held to prevent him from hurting himself. A folded towel may be placed between his teeth, or a cork with a string attached. The attacks are usually followed by a deep sleep, which may last for hours. Let him alone, but keep him well covered and stimulate with hot-water bottles.

Some physicians recommend massage and gymnastic exercises for the treatment of epilepsy, but the exercises

must be of the very mildest form, as, according to the latest authorities, epileptic attacks are explosions of nervous force, and anything even indirectly exciting should be eliminated from the prescription.

Cephalalgia is commonly called headache. It may be very successfully treated by massage; kneading, friction, and percussion should be used according to the part affected. The kneading and friction should be continued along the large vessels of the neck.

Disorders of Locomotion.

Disorders of locomotion include *muscular rheumatism*, *rheumatic gout*, *periarthritis*, *sprains*, *fractures*, *synovitis*, *lordosis*, *scoliosis*, *kyphosis*, *Pott's disease*, *rheumatic arthritis*, *rachitis*, *etc.* Muscles are the primary organs of locomotion; the accessory organs are bones, ligaments, tendons, and synovial membranes, and diseases of any of the accessory organs will directly interfere with locomotion — perhaps more than the diseases affecting the muscles.

Bones are very complex organs made up of fibrous calcified matrix or stroma with cartilage cells and, later, bone corpuscles embedded in it; lacunæ, spaces or pores which increase or diminish the porosity of the bone and increase or diminish the possibility of nourishment; a medullary canal with marrow, blood-vessels, connective tissue, lymphatics, and nerves; periosteum, with external fibrous layer containing blood-vessels and an external layer with a finer capillary plexus. All or any of these elements may be diseased. Bone depends for nourishment on marrow and blood-vessels. It is capable of growth to a certain period through epiphyses and diathyses.

Rachitis, or rickets, is a constitutional disease affecting all parts, but most conspicuous in long bones and in ligaments, causing a lack of tonicity with a consequent

stretching. This produces knock-knees, bow-legs, and flat-foot. Weakening of the muscular tissue, undue amount of sweating, and sudden changes in liver and spleen are also conspicuous manifestations. It is infrequent in the country, very common in tenement-house districts; found chiefly among the poor in large cities, although many children of well-to-do parents suffer from it. It is probably due to improper food, etc. Statistics are not reliable because many slight cases are not diagnosed, but many cases of weakness and general absence of endurance in children are due to it. It is more common and more severe in Europe (especially in southern countries); it is very prevalent among negroes. It usually begins during the first or second year, but may not appear till the seventh, eighth, or ninth.

Causes of the disease are disturbance of the general nutrition of the body during infancy and childhood, poor food, etc., also substitution of patent foods for mother's milk, especially condensed milk. The etiology of the disease is obscure. It is generally ascribed to deficiency in the earthy salts, with an absorption of those already formed.

Sometimes the bones are so soft they can be cut with a knife, thus great deformity results, and *scoliosis* may be due to the pressure of the head and shoulders on the softened bones of the spinal column, plus a lack of tonicity in ligaments and muscles.

Kyphosis, or hump-back, may arise from the same cause. *Lordosis* also may result. Wherever bone and cartilage join there is an enlargement, and there are protruding bones at the wrist and ankle. The skull is also affected, causing what is known as *Craniotabes*. A rachitic child has very prominent frontal and parietal bones. The abdomen is also unusually prominent. The bowels are constipated, and there is a tendency to inflammation of all the mucous membrane in the body. The liver and stomach are enlarged. The child perspires at the junction of the hair and face, and the whole body is more or less wet. He is very restless, especially at night. In the treatments, passive movements alone should be used. There should be friction and kneading of the deformed parts, as well as of the whole body. It is advisable to use oil during manipulation; cod-liver oil is generally preferred. When the long bones are bent, gently bend and spring them back into place. As long as you get this spring you can accomplish something by this treatment, but if the bones are hard they must be put into apparatus.

Fracture may be described as a sudden forcible destruction of the continuity of a bone in whole or in part, except when done with a cutting instrument. Fractures are incomplete, complete, and compound. In incomplete the bone may have been simply fissured; there is a fissure or crack of a bone for a limited extent. We find this in

the cranium and face. True incomplete fracture is known as a *greenstick fracture*; this involves only part of the thickness of the bone, usually some longitudinal splitting and rending of the outer layer. We find it usually in children; most often in the forearm and clavicle. Another form of incomplete fracture is where a splinter of bone is separated from the bone. This is caused by something forcible, as a sword, bullet, or violent muscular contraction. Pott's fracture is where the lower end of the fibular is broken off.

Fractures are complete when the bone is entirely broken through. According to the direction of the fracture it is transverse, oblique, longitudinal, toothed, V shaped, and T shaped. When named with relation to the neighboring joints it may be intra-articular, extra-capsular, or intra-capsular. It is sometimes named according to the mode by which produced, as fracture by direct violence — here the fracture is produced at the point where the force struck; fracture by indirect violence — here at a distance from where the violence was felt, as when falling on the hand fractures the arm; fractures by muscular action — sometimes in falling from a height the biceps will fracture the humerus if there is poor condition of the bone. Fractures are also named according to the number of parts fractured or extent and character of the crushing; they are multiple, comminuted

(splintered into many fragments), impacted (one portion driven into another), found in the wrist and known as Colles' fracture; lower part of the radius goes up and the upper part is pushed into it. A compound fracture is where there is an external wound. The external wound may be caused from without in, the same violence which produces the fracture causing the external wound; it may be from within out, a sharp point of broken bone may work out and the parts may be so bruised that nutrition is interfered with and there is a sloughing, and fragments work through that, or rough handling at the time of the accident may cause a wound. The patient may become delirious at the time and his movements cause a wound.

The objective symptoms are: a deformity, which consists of a general change of appearance, change in contour, in dimensions; the muscles contract from elasticity, and this shortens the limb if the ends over-ride each other; there is an increase of circumference, a change in relation of different parts; more or less swelling, heat and redness usually; an abnormal amount of mobility — i.e., independent mobility of the fragments (we find this in the shaft, not often in the extremities); also crepitus, produced by the rubbing of the broken ends together — not always present, but if present always pathognomonic of fracture.

The subjective symptoms are: diminution or loss of function; pain both spontaneous and elicited by the movements of the parts or by pressure.

The lesion consists of the separation of the bone into two or more parts, a tearing of the periosteum, and laceration of soft parts; there is usually a strip of periosteum which unites the two fragments; this is known as the periosteal bridge, and is important in the process of repair.

At first there is congestion of the parts, leucocytes hurry to the place to carry off the waste matter; following the congestion are swelling, discoloration of the parts externally, and ecchymosis. Under the periosteal bridge granulations are forming.

These granulations become cartilaginous and finally bony. On the edges between the bones in the medullary canal other granulations form; these grow, connect with each other, and with the granulations under the periosteal bridge. These granulations become fibrous, and this forms what is known as the "callus," and in three or four days this can be felt. This callus extends like a plug into the medullary canal, and more or less on the outer surface. Cartilage cells from the periosteal bridge become bony, there is a deposit of lime salts in the callus, and this goes on from three to six weeks, till the bone is firmly united. Before it becomes bony new

blood vessels push their way into it, the plug in the medullary canal is absorbed, and there is a complete union, probably stronger than before.

There are certain complications and sequelæ which must be considered. There is usually a slight increase in size of the bone at the place of fracture, and the length is slightly increased. The usefulness of the bone may be impaired. If the fracture be near a joint there is more or less stiffness; the callus may adhere to a ligament, or there may be inflammation in the ligament, which will make the joint stiff. Rheumatoid arthritis often affects fractured joints. It has been said that immobilization causes stiffness, but this is not permanent. Paralysis may follow from injury to the nerve; the callus may press on the nerve. The great danger is embolism; it may be fat or blood embolus. Blood-clot may be carried along and fat from the marrow in the same way; also danger of rupture of large blood-vessels; gangrene sometimes follows. It comes from the crushing and destruction of large arteries and nerves, so the part beyond the fracture suffers from the nutritive supplies being cut off. Septicemia and pyemia sometimes follow. With a compound fracture, pyogenic micro-organisms have access and set up septicemia. Pyemia comes from micro-organisms forming an embolus and being deposited in the organs. Tetanus, or lockjaw, is very uncommon, but a

common complication, observed in hospitals, is delirium tremens.

The time of healing varies with the position of the injury and age of the patient — probably never less than three weeks, and it may be six. It is longer in adults, shorter in children ; longer for shafts, shorter for ends.

If a case is sent after one week, be extremely careful in handling ; give nothing but the *lightest friction.*

Good authorities say a Colles' fracture should be treated by massage from the very first. There is danger that the fingers may become stiffened, so it is perfectly allowable to treat after one week. After the healing the muscles are flabby and atrophied, joints are stiff, skin hard, limb sensitive, with probably more or less neuritis. There is a tendency to venous congestion and œdema.

In the treatment of fracture the utmost care should be taken not to displace the bones. For this reason conservative physicians prefer to wait from two to three weeks (preferably the latter) before applying massage. All the sequelæ may be successfully treated. For flabby muscles give kneading, percussion, and active movements, first assistive and then resistive; for stiff joints, kneading and active movements, being careful to know the axes of motion and the normal limitations. For hardened skin give kneading, stretching of the skin, and for this it is often wise to use a lubricant. For venous

congestion and œdema give kneading. There may be an extreme amount of callus, so that it presses on the vessels, etc., and interferes with motion; for this try kneading, pressure, and percussion, but do not encourage the patient to expect anything more than moderate results.

Dislocations are displacements of one or more bones of a joint, or of any organ from its natural position.

These may be complete, compound, consecutive, partial, or incomplete, recent, simple, etc., etc. Incomplete dislocation is sometimes called sub-luxation. If there is a discoloration with some other lesion (as a fracture or tearing) it is called a complicated dislocation.

Usually one or more ligaments or the capsule may be torn, attached muscles may be ruptured, or torn from their attachments, and prominences of bone may be broken off. Ligaments may be torn out from their attachments to the periosteum, or portions of bone may be torn off. In Pott's fracture we usually get the internal malleolus torn off. With a paralyzed limb the joint is usually relaxed, and very often there may be dislocations without lacerations.

The symptoms include change in contour, change in attitude of the patient. Very often we find the head of the bone in an abnormal location. In dislocations of the shoulder we often find the head of the humerus under the coracoid process. A change in length of a limb occurs from a shortening of the muscles. There is usually a difference of one and one-half to two inches in dislocations. Mobility is limited in some directions; there is naturally a contraction of muscles to protect the joint. There may be abnormal mobility in other directions. There is always pain or soreness.

The dislocation must be reduced and immobilized for several days, then begin with slight manipulations, increasing from day to day. Do not give resistive movements for a week or ten days after beginning the treatment.

Sprains are the most common form of injury to a joint. A sprain is a wrenching of the joint, producing a stretching or laceration of the ligaments. It is most frequent in the ankle and wrist. It may be slight and the symptoms subside quickly, or it may be severe. The synovial membrane is compressed on one side, while on the other it is unfolded, stretched or torn. Ligaments are usually stretched on one side only. Some of the fibres are torn, and sometimes the whole ligament may be detached from the bone, and even small parts of the bone may be torn off. There is more or less laceration of vessels with attendant hemorrhage into the joint cavity. Colles' fracture is easily produced by the same fall that may produce a sprain.

The pain from sprain is severe, with intervals of comparative ease after the first pain disappears; then there is a return of pain after a day or two or perhaps twelve hours. This is more of an ache; the other is a sharp pain. There is swelling of the parts, effusion into the cavity, and immobilization from the swelling and consequently stiffness.

If there is no fracture treat as soon as possible by massage. Precede the treatment by immersing the part in hot water or alternate hot and cold water for one-half to three-quarters of an hour (to relax the tension.)

The first procedure is then gentle friction, gradually increasing in force (as a peripheral nerve sedative,) gentle kneading, long continued, beginning at a distance from the injury and gradually approaching it. If there is a great amount of swelling, use vaseline with the friction and kneading, as the skin is easily ruptured. If there is much effusion, use the peculiar form of kneading, but it cannot be used for three-quarters of an hour or so. End with palmar percussion. Bandage tightly, then order ice bags to take down the inflammation and insist on perfect rest for twenty-four hours; apply ice bags for an hour, then remove for an hour, then ice again, and so on.

On the second day repeat the treatment of first day, omit ice and add passive circumduction and passive flexion and extension if there is still pain and tenderness. On the third day use treatment of the first two days, with resistive movements added. Have the patient stand and walk a little with help occasionally through the day. Encourage activity, except statical. Be sure the limb is used between the treatments after second

day. Remove the bandage permanently the third or fourth day. An average sprain takes from four to seven days to cure, though one of hip or shoulder takes longer, as it is safer not to use them for a week.

If a sprain is left to itself, all the tissues stiffen and produce peri-arthritis, which gives more or less constant pain or neuralgia. In this case use pressure for enervation, ulnar percussion as a stimulant for motor and trophic nerves, for muscles, vessels, and glands, thus increasing absorption. Give also violent kneading and such resistive movements as cause the most pain.

NOTES:—A sprain drives the movement beyond the normal limit of motion. Massage is indicated even if the ligament is torn, as there is nothing in the inflammatory product which is poisonous to the system. In torn ligaments you can not use massage for a week. For sprains, give kneading of the proximal side, beginning some distance away, and gradually approaching the sprain. Give gentle friction on the outside, gradually approaching the swelling, while kneading at the same time.

For resistive movements use those which offer resistance to the contraction of those muscles which tend to take the place of the ligament which has been sprained.

It is not always necessary to use bandages, but they should always be used in bad cases, and for patients

whose muscles are unusually flabby. The bandages should be gradually loosened, and they may be left off for the first time at night. It must be remembered that the bandage retards recovery, as it takes the place of the muscles.

A *strain* is an earlier and slighter form of a sprain; you wrench and twist the muscles only. If you keep still instead of exercising you will have a permanently weak joint. Give massage at least once a day, and in bad cases twice a day, the treatment lasting about fifteen minutes. Old sprains may turn to neuralgia and possibly periarthritis. The friction used in sprains starts the superficial circulation and soothes the cutaneous nerves. A sprain of the knee should be bandaged, because the knee has to carry so much weight. A flannel or linen bandage is the best; after a few days, the patient may wear an elastic hood. In fractures, do not give too much massage or you will prevent the healing process. The patient often feels as if an electric current were passing through the limb, owing to the increase of nutrition to the part. Rubber on a fracture will serve to increase the inflammation. Use linen or flannel.

Synovitis—is caused by an overstretching of the membrane, by a concussion causing a partial rupture of a wall, or spontaneously by a weakening disease. It may be acute or chronic. If very acute, it remains confined

to the synovial membrane, but it usually extends and involves other structures, becoming *arthritis*. There is excessive secretion of synovia, causing a distension of a capsule. There is but slight change in the adjacent tissues. Sometimes the disease invades the capsule in patches and we get a series of distensions inside the same capsule, often with an adhesion of the membrane to the cartilage. In acute synovitis, the secretion may be normal in appearance, or it may be watery, or with exudation of fibrin. The joint is painful, especially when in motion, and at night. It is swollen and tense. The joint is held in medium flexion, as this allows the greatest extension with least pain. Chronic synovitis always extends to other structures. The membrane is little changed in appearance; but it is œdematous (lymph spaces filled with effusion); and later the structures become irregularly thickened by plastic exudations. There is no pain, but movements, especially of extension, are limited. If the fluid is absorbed, there is a sound of grating or creaking; if fluid is present, we get fluctuation, and the adjacent muscles are atrophied from lack of use, and the nerve supply is affected.

In treating acute synovitis, keep the limb at rest for awhile, using very gentle friction occasionally till the inflammation begins to subside. (This must be judged by decrease of pain and swelling, and not by decreased

fluctuation.) Then use deep friction with vaseline, grasping the whole capsule with both hands, and pushing the contents forward to empty them into the efferent lymph vessels and veins, taking care to prevent regurgitation behind the hand as it slides along. In a case of long standing you must first produce an acute inflammation (by giving palmar percussion for about ten minutes), and then after two or three days you can treat it as any acute case. There is an elastic recoil in synovitis. Avoid giving resistive movements until the last trace of effusion is removed. After the joint appears to be well, it is a good plan to wear an elastic cap. Synovitis of a closed joint is easier to cure than when an open joint is affected. If not treated at an early stage, it will produce a weak and unreliable joint.

When the joint is tired, acidity increases, the efferent vessels clog and dilate, more synovia is secreted than can be absorbed, and the capsule becomes distended. The pressure is painful. Motion becomes diminished from tension in the ligaments, tendons, etc. Massage in synovitis is usually extremely painful, but it is absolutely necessary to use enough force to produce the desired result, however great the temporary suffering. Synovitis is always present more or less in a sprain, only then it is a symptom produced by nature. A sudden strain has the same effect as a mechanical irritant to the synovial

membrane, producing an inflammation with too lively a secretion. In synovitis of the knee, it is well to use a bandage, on account of the weight carried by that joint.

Tendons are liable to inflammation, and *teno-synovitis* is where there is effusion in the folds of a membrane passing over the tendons of a joint. This may also be acute or chronic. The acute form is due to traumatism, but it may be connected with rheumatism, syphilis, or gonorrhœa; the chronic form is usually tuberculous. The acute is characterized by swelling, pain, and a peculiar sound like the noise made by rubbing together two pieces of silk. This sound disappears when there is fluid accummulation, and reappears when absorption takes place. In chronic teno-synovitis, there is first a low grade of granulated tissue, which forms in and on the sheath; this forms a swelling, or it may be a less solid deposit, and we get a fluctuating swelling. Granulated tissue may break down and become fluid or pus, and then there is a fluctuating swelling. Or granulations may form on the sheath and break off so we get little solid particles moving in the sheath, known as rice kernels. This is usually found in the vicinity of the knee and ankle joints, and in the fingers. There is very little pain. For treatment, do not touch an acute case until the inflammation subsides, then proceed as in synovitis. In a chronic case give gentle kneading, and

later resistive movements, bringing into play the affected tendon. Isolate the movement to the tendon or group to which it belongs. If the symptoms do not yield to massage in six weeks, the part must be punctured and washed with carbolic acid or iodine. Then there is a new effusion which yields readily to massage.

Weeping sinew is really hernia of a tendon. It is found usually on the back of the hand. There is a round, hard swelling, varying from the size of a pea to a silver dollar. It is sometimes almost as hard as bone. The swelling is caused through some weakness of the tendon-sheath covered by synovial membrane, so the sheath bulges out and takes the synovial membrane with it. The cavity thus made becomes filled with a viscid honey-like fluid. For this give hard, deep kneading with firm pressure, friction with vaseline and resistive movements while pressing on the affected part. The effort is made to rupture the sac, so that the contents may be absorbed. It may refill.

Bursitis is inflammation of a bursa. The bursae are small sacs interposed between parts that move upon each other, as tendons and joints. The most common form of bursitis is known as *Housemaid's knee.* It comes from pressure long continued. Bursitis may come around the ankle from ill-fitting shoes, or it may come from the friction of the support used in cases of deformity.

Housemaid's knee is a chronic inflammation of the bursa in front of the patella. There is a large fluctuating swelling, with the patella floating forward. It is usually painless. Press with the hands above and below the knee, confining the fluid to that space, then with the forefingers press on the patella, and if you can move it up and down, bursitis is present. Massage may do something for the patient. Give kneading and prolonged percussion. Should the effusion be in spots, follow the percussion with kneading. Ordinarily, complete rest with immobilization in splints is necessary.

Rheumatism—may be *muscular*, *articular*, or *rheumatoid arthritis (arthritis deformans)*. *Gout* is classed with rheumatism. The causes are muscular fatigue, strains, indigestion, exposure to wet and cold, etc. Sometimes rheumatism has been accredited to a disturbance of nerve-centres, presiding over the nutrition of joints and muscles, sometimes to the presence of lactic acid in the blood, sometimes to the excessive accumulation of uric acid from retardation of the circulation, and sometimes there is a theory of microbes. *Articular rheumatism* may be acute or chronic. If acute it is known as *rheumatic fever*. The "growing pains" of children are really due to rheumatism. In articular rheumatism there is a serious synovitis of the joints, with great pain and tenderness. The skin is usually red

and œdematous. The large joints are most liable to be attacked. There may be serious cardiac, pulmonary or nervous complications also. Where the heart is affected, there is a marked tendency towards *endocarditis*, and less frequently towards *pericarditis*. In endocarditis the mitral valve is apt to be affected so there follows mitral regurgitation. *Pleurisy* is quite commonly complicated with rheumatism, and also *pneumonia*. Different forms of eruptions appear with rheumatism, such as *erythema*, reddening of the skin; *urticaria* (hives); rheumatic nodules, attached to the tendon sheaths, bony prominences and cranium, which are most common in the joints most used, as the fingers, wrists, elbow-joints, spines of vertebrae and along the crest of the tibia. These may become permanent deformities. Rheumatism may also be complicated with *tonsilitis* and *pharyngitis*. Chronic articular rheumatism may follow acute, or it may be chronic from the start. It is very much affected by cold and damp. The synovial membrane becomes congested and thickened, the capsule is thick, and there may be fibrous bands formed between structure of the joints, these contract and cause more or less deformity and sometimes *ankylosis*. On account of the pain, there is muscular contraction which tends to produce deformity. There are no cardiac complications with the chronic form of rheumatism, except

sometimes in children. In treating chronic articular rheumatism, try to get normal motion in the joints and prevent stiffening. Give percussion very carefully, as the adhesions must be broken up forcibly and the joints moved. Prevent further deposits of uric acid by following all procedures by kneading. It is very difficult to break adhesions, and the patient may faint under the strain. This should never be attempted, unless the masseur has a thorough knowledge of anatomy as instead of breaking the adhesion, he may snap the bone itself. A great deal may be done in cases of chronic articular rheumatism, but it takes a long time.

Muscular rheumatism is rapidly cured if taken early. The pain practically amounts to a neuritis of the musculo, cutaneous nerves. If you slip your hand on a muscle that has rheumatism, there is a sensation like smoothing ground glass, or some other substance which is particularly rough; you may even hear a distinct sound. The affection spreads through the whole muscle, making it swollen. There may be enlargements due to the crystalization of acids, which do not move along. This is the explanation of the rough feeling which is not noticeable in chronic cases. It is a question in my mind whether there is such a thing as chronic muscular rheumatism, for when it has run for some time it usually develops into something else—neuritis, perhaps—the same as an old sprain

turns into neuralgia. Supra-spinalus muscles and trapezius, the deltoid and quadriceps, and the muscles of the lumbar region are particularly sensitive spots. The pain may be dull and aching or sharp and cramp-like, increased by motion, decreased by pressure. If there is rheumatism in the extensors, the limbs are flexed, and vice-versa. If the disease affect the sterno cleido mastoid or other muscles of the neck it is called *torticollis*. If it involves the intercostals it is called *pleurodynia*. If confined to the muscles of the lumbar region it is *lumbago*. In the last named, the treatment consists of kneading of the lumbar region, with resistive trunk rotation and trunk forward flexion.

As a general thing for all cases of muscular rheumatism, begin the treatment with gentle kneading and friction. If there is temperature let the case alone. In sub-acute cases give kneading and resistive movements. Judge of this by the temperature or ask the physician's advice. In very painful cases, give gentle friction and then nerve-pressure as preliminary procedures. Give general treatment to increase the circulation and the quality of the blood. In acute cases you may sometimes give a very gentle general treatment.

Muscular rheumatism is often mistaken for neuralgia, and the two are very much alike. In neuralgia we rely on nerve pressure, percussion and kneading. In muscular

rheumatism we increase the kneading and diminish the pressure. If the muscles are highly sensitive to touch, it is well to numb the afferent nerve that we may have better opportunity for kneading. Practise that movement under resistance which hurts most, preceding and following it by kneading. Passive movements accomplish next to nothing unless you can empty the large veins. Give palmar percussion. Tell the patient to drink plenty of water, as long as the urine continues scanty and high-colored.

Arthritis deformans, *rheumatic arthritis*, *rheumatic gout*, may follow rheumatism proper. The cartilage of the joint becomes fibrinated, soft and velvety, worn away in the centre, exposing the bone ends. At the periphery of the bone end there are bony outgrowths of dendritic (branching) character, known as *osteophytes*. They form in both bones of the articulation, the osteophytes of one interlock with those of the other, causing a deformity. The synovial membrane becomes thickened, which increases the size of the deformity. The muscles atrophy from lack of use, and the skin of the affected parts is very glossy. These joints are very painful after indiscretions in diet. If many articulations are affected at once the disease is often diagnosed as acute articular rheumatism. In treating this disease leave the acute stages alone, lest it prove to be inflammatory rheumatism:

with this there is high fever and other symptoms of more or less general character. This state only remains a short time, it then turns into something else. The cause is constitutional, or dependent on a disordered liver, or the deposition of uric acid in the blood (the acid crystals cause an occlusion of the capillaries, especially around the joints). This affection usually begins with a little swelling, stiffness, pain, impaired motion, the joint increases in size and is finally incapsulated. When this joint has become full and painful, the disease spreads to the next until it is universal. The less motion there is the worse for the patient, as the muscles cake together and settle to the articular cartilages, so that movement is suspended. When the muscles press on nerve ends there is numbness, loss of sensation of movement. Finally the adhesions form and produce an ankylosis, which may have to be broken, if it does not yield to a milder treatment. To soften and loosen the accumulation of acids, give persistent percussion even to producing a mild inflammation. Give gentle kneading, increasing the return current from above the joint and distributing the effusion by pressure. Work from above first, pushing along and squeezing out, as the synovial membrane is usually irritated, and driving the fluid into adjacent lymph spaces. Give circumduction and kneading to distal parts, otherwise the bad conditions are

aggravated by the treatment. The kneading above the joint must be thorough and deep, and it hurts very much. After a few treatments with this kind of kneading, the operator may begin on gentle passive movements, always tentatively—feeling his way—gradually increasing the sphere of motion. Before attempting this, however, the adjacent tendons and ligaments must have been softened and loosened. It is essential to have a firm grasp of the limb, and as the bone has become brittle great care should be used. Ordinarily do not give percussion unless there are adhesions. Resistive movements hurt the patient and often accomplish very little. Use judgment. Ordinary active exercises of everyday life may accomplish more. Let hot water run over joint for five minutes before and after treatment. Electricity may be used to advantage in some cases after treatment. Keep the blood pressure as low as possible all the time during the treatment of the disease. Vibration of the whole limb may often be employed with success. Don't give up, if the patient shows little progress. He may grow worse for the first week, perhaps for the first two or three. Persist for at least three months. A young person may be entirely cured by proper exercise, massage and diet.

In swollen joints use passive movements. In shrunken joints use resistive movements to increase nutrition.

Gout—may be inherited, or it may be acquired by over-eating or other bad habit. There is a form known as *poor man's gout*, which is due to poor hygiene, poor food, and indulgence in malt liquors. Gout may arise from any of the above-mentioned causes of rheumatism. It is characterized by paroxysmal pain, accompanied by the deposit of sodium urate. The great toe is most commonly affected, and next the small joints of the hands and feet. The attack usually comes on at night, is attended by a glossy swelling of the joints, which disappears in the morning. The symptoms are slightly different in acute and chronic attacks, and there are also some irregular forms. With acute, there are usually premonitory symptoms, such as twinges, cramps, general irritability, dyspepsia, over-acid urine, etc. The attack proper usually lasts about eight or ten days. As the acute attacks become more frequent, the joints begin to show deformity and get crackling sounds. When there are irregular or ab-articular symptoms, there may be eczema, hot itching feet, dyspepsia in various forms, over-acid urine, renal calculi, headache, insomnia, vertigo, hot eye-balls, shooting pains in muscles, and a characteristic tenderness in the heels. Active exercises are better than massage in cases of gout. Sometimes a form of the disease may be averted or kept in check by massage. Only kneading and friction should be used.

Scoliosis—is any deviation of the spinal column from the median line with resultant distortion of the trunk. Anterior-posterior deviation is *Pott's Disease*.

Scoliosis may be muscular or osseous. The majority of cases are first muscular, then osseous. In the first form, there are no structural changes in the bone, and so the disease is capable of cure. The second or osseous form may be greatly improved, but seldom cured. Scoliosis may be congenital or acquired. The latter form usually begins about the eighth year, and it is found in from one to two per cent. of all children. It is a fact that parents seldom discover the early stages of this disease, but usually the dressmaker or some disinterested party calls attention to the deformity. If it were treated at once it could be cured. Scoliosis may be caused by unequal muscular action, or by inequality of growth of different parts of the vertebral column (localized unilateral hypertrophy) or it may be due to super-incumbent weight acting on a faulty condition of the spinal column. The last is the most common cause.

If we consider unequal muscular action, the active contraction of muscles on the concave side is not usually accepted. The theory of primary muscular weakness on the convex side explains many phenomena found. Large exterior muscles are called extrinsic, the smaller muscles which are peculiar to a part are called intrinsic.

If the muscles are weak, the trunk will be drawn to the opposite side and the weak muscles will be stretched out. In weak persons, bad posture long continued may tend to weaken the muscles; but it is more probable that the bad posture is caused by weak muscles, so we may consider the weak muscles the predisposing, not the exciting cause, and the weakness is probably confined to the intrinsic muscles, as we usually find the spine affected in segments.

The third theory is accepted by the greatest authorities, and there are many proofs that this theory is correct. By the removal of the super-incumbent weight in the first stages, the patient recovers, and in later stages, when rotation is present, the curve will not disappear, and it has been proven by experiment that weight will cause it. If the weight falls on the column in a perfectly vertical direction, it may cause an anterior-posterior curve with the convexity backward, but it can not be perfectly vertical, as there is always an incline on account of the mobility of the head, so there appears a lateral curve. The bodies, or largest part of the vertebrae, being less firmly attached by ligaments, go to the side of the convexity, while the spines go to the side of the concavity.

In a well-defined case of scoliosis, there is lateral deviation with rotation, the muscles and ligaments are altered in tonicity and lengthened, and the intervertebral substances are compressed on one side. We finally get

ankylosis of the vertebrae. There is usually a compensatory curve either in the cervical or lumbar region, so that equilibrium may be preserved. The dorsal curve is usually the primary one, as there is anatomically more rotation in the dorsal region.

In examining, give the patient the "Adam's position." The curve that straightens is the compensatory curve. If there is a large curve, the ribs are compressed on the concave side and they protrude posteriorly on the convex. The sternum is drawn towards the convex side and is more prominent on the concave side. There may be so much deformity that the thoracic viscera are displaced. As the spines rotate towards the concavity, the muscles running between them and the vertebral border of the scapula (principally the rhomboidei) become relaxed, the scapula drops, and is rotated outward by the opposing muscles. As the lumbar curve develops, the hip on the side of the concavity rises, so that the high hip is on the same side as the high shoulder.

Single curvature usually has the convexity to the left, and is most common in men; double curvature usually has the dorsal convexity to the right, and is more common in women. Cervical or high dorsal curve is the least common; when it occurs it is usually accompanied by a long compensatory lower curve, always by elevation of one shoulder and inclination of the head to the side

of the concavity of the cervical region. The dorsal curve is the most common, and the curve is usually to the right. The right shoulder appears to be raised, and the left shoulder is further from the median line. A lumbar curve manifests itself by the prominence of one hip, usually on the concave side, and the convexity is generally to the left. Curvature of the spine, although usually caused by the weakness of the intrinsic muscles, may occur in the first stages of caries of the spine, or in rachitis, or it may be intra-uterine. It has been known to follow infantile paralysis, also empyema in children. Occupation may cause it, although the labour must be very severe to affect the spine of a well-grown adult.

There are three stages to consider, first, the initial stage, belonging to early childhood; second, stage of development from the beginning of puberty to the end of growth; third, stage of quiescence, when growth is completed. The last is the hardest stage to treat.

In treating scoliosis, it must be remembered that each case is individual, and requires special study and attention. The patient must be informed that no improvement can be looked for until after many months' treatment, and the majority of cases require treatment for years. The operator must observe three general rules: 1, give movements to contract the long side; 2, give movements to stretch the short side; 3, find, by experiment, a com-

pencing position which will restore as far as possible the normal position and give the exercises from that position. Treat the patient stripped. Having placed the patient in Adam's position, examine the curve carefully, and mark the spinous processes with a pencil. Measure the inequality of the hips in two ways: 1st, find the crest of the ilium (patient standing), and let the measure touch the floor; measure both sides. 2nd, have the patient lie flat on the floor, a straight ruler placed in a vertical position on a line with the umbilicus. Now make a line across at right angles, and this will show the deviation.

While the patient is in Adam's position, the decision must be made as to which curve is primary and which compensatory. Measure the legs to see if the curve has been produced by any difference in length. This measurement is best taken while the patient lies flat on the floor, perfectly straight, heels together, and the measurements should be from the anterior-superior spine to the internal malleolus. The amount of rotation may be estimated by placing the patient in Adam's position with arms folded, and noticing the protrusion of the ribs. There is no accurate way of measuring rotation. Before beginning treatment it is absolutely essential that the patient's heart and lungs be examined by a competent physician, as very strong exercises must be used, and a weak heart will preclude all possibility of such exercises.

In double curvature, use sitting position to correct the lower convexity and unilateral standing or lying to correct the upper. If there is rotation do not use turn position at first, but wait until there is greater mobility of the vertebrae. Before giving movements to the spine, adjust the scapulae by unilateral position of the arms, so that they are in fairly good position. Give resistive movements of the arms that will permanently locate the shoulder-blades. On the concave side, the extensors of the back are strong, and the muscles of the scapulae are weak. Let the commencing position be such as to affect the extrinsic muscles while the movements affect the intrinsic ones. Give many hanging movements with over grasp on the side of the concavity. If a child's hip protrudes, give hanging with over grasp on that side. Give hanging position for home exercises, for by this you lift the super-imposed weight. After a few weeks, give turn position as a commencing position with rotation, as well as with all back extensions and sideways flexions. In correcting the lumbar curve, which is usually compensatory, isolate the trunk by hanging position, or by flexion to the side of the convexity, as otherwise the movements will increase the convexity. In respiratory exercises use unilateral commencing position of the arms. Isolation of the hips may be produced by wlk. st., fall-out st., and step st. positions.

For single curvature the following exercises are used. It must be understood that these are examples only.

Sitt. r. (or l.) A. ext. upw.

R. str. side ly. l. hip. elev.

R. w. l. under grasp hanging, 2 L. abd.

R. w. l. under grasp hanging, 1 Kn. flex. upw.

In hanging, the weight of the body is suspended from the sixth dorsal vertebra, the vertebrae below are drawn apart by the weight, and so brought in a straight line. Hanging does little to straighten the upper dorsal or cervical curve. After treatment has continued long enough, add weight by resistive movements bringing the muscles of waist into play. Hold on around patient's waist and pull down in hanging position, using greater force on the side of the convexity. Give also hanging resistive neck extension.

R. str. l. reach gr. st. neck ext.

Stretches the trapezius and has a tendency to draw the spinons processes towards the median line, and the upper transverse fibres help to hold the arm in upright position, while the vertical fibres do the active work of extension.

L. rest r. wg, (l. leg supported in wlk. b, side step or F. side gr.) Sidew. flex. to l.

For double curvature examples of exercises given may be:

L. str. gr. l. side ly. l. hip elev. (assistant supports upper leg, support only just above the knee.)

Reach gr. high st. hip elev. and depress.

L. str. (rest) r. wg. stoop sitt. — l. turn stoop sitt.— or l. wlk. b. st. back ext. (Operator presses on the height of the convexity (from the rot,) forw. inward— commencing pos. levels the shoulders. First give in sitting position then make a progression into st. pos., forw. ft. on the side of the lower hip. wg. pos. or fund. pos. if there is a high dorsal or cervical curve. Rest pos. if the curve is principally dorsal, and Str. pos. if the curve is quite low.)

L. rest (str.) concave side, r. wg. stoop sitt. or st. T. flex. to r. (Operator presses on the side of the convexity with a vibratory movement, sitting so as to rest his own elbow on his knee, patient bends over to the left, then operator gives resistance as the patient goes over to the right.)

1-2 str. reach F. gr. neck ext. Foot up on the side of the low hip, and str. on the side of the low shoulder.

In sidewise flexion st. pos. is most used as by it the muscles of the hip contract and the lower hip is raised. In double curvature use ride sitt. position to isolate the hips, this gives a higher arch in the flexion. If there is much inequality in the hips, place a book under the low hip and with rotation use turn pos. to the side of the con-

cavity after two or three weeks treatment. In double curvature, instead of sidew. flex. take side fall. pos. on the side of the dorsal concavity. Gravity tends to straighten the concavity and the lower muscles contracting tend to straighten lumbar curve. When the patient becomes stronger, take the position on the side of the convexity, with str. pos. on the side of the concavity and leg elevation on the side of the lumbar convexity, later with resistance. In single curvature, lie on the concave side, with the arm of that side behind and under the head, then give resistive leg elevation.

Side ly. T. elev. is given for either single or double curvature. One knee is drawn up slightly, sometimes the legs are strapped to the couch. For the upper curve give support near the shoulders and rise to the side of the dorsal convexity. For the lumbar curve, give support below the hip joint.

For a child with a slight curvature, give special traveling on the vertical ladder, with constant turning to the concave side. In hang. pos. to emphasize the lifting of the low shoulder, hang with over grasp and incline the bar so that the hand of the low shoulder shall have the higher grasp. In movements with bend under grasp have the bent arm of the low shoulder on the low side. In oscillatory traveling with an inclined bar, travel down hill towards the side of the high shoulder.

Disorders of Uterine Organs.

Abnormalties of the female organs produce diseases known as Amenorrhea, Dysmenorrhea, Menorrhagia and Mettrorrhagia.

Amenorrhea — absence of menstruation — may be primitive or secondary. It is primitive when the catamenia have not appeared at the proper time, and secondary when the discharge has been arrested after it has existed. If the disease is congenital it is due to malformation of the generative organs or to tardy development. There may be a lack of the uterus or ovaries, or there may be atresia (a partial or entire closing of the canals.) Infantile uterus is the term used where the organs have never developed. If amenorrhea is acquired instead of congenital there is irregularity in establishment of the function; it appears and does not return. This may result from general debility or anemia. In phthisis, because of the lowered vitality, the function usually ceases. The disease is sometimes caused by change of climate. During pregnancy amenorrhea is normal. After pregnancy the uterus must return to its original size. This process is termed *involution*. *Super* involution is excessive involution where the uterus atrophies, and the menopause comes too soon. Mental emotion, cold, etc., may disturb the function for one or more months, but unless there are symptons of unrelieved congestion with scanty menstruation, we can

not apply the term amenorrhea to the case. The chief symptom is lack of flow; with congenital, there is late development, shy disposition, and the patient is anemic and thin. There is usually more or less congestive headache. With acquired amenorrhea there are usually digestion disturbances with insomnia, backache, cold hands and feet, etc. Sometimes there are bearing down pains, pains in thighs, a sense of numbness and even vomiting. If the disease is due to general debility, give treatment to increase the general metabolism and to improve the quanity and quality of blood circulating. If the patient is weak and emaciated give general massage and as soon as possible general gymnastics with special exercises to stimulate circulation and nutrition in the pelvis. The most important special exercises are Kn. st. T. rot., Sacral perc., Supra pubic pressure. Make them as strong as the strength of the patient will allow. If the disease is due to colds, mental emotion, change of climate, etc., give quick pass T. rot. and oscillatory travelling on the bar. In all cases give massage along the tubes and ovaries and down the inside of the thigh. *This must not be given unless a physician has assured the masseur that there is no danger of pus.* During the first two and last two months of pregnancy do not give massage or medical gymnastics. Do not allow the patient to jump, vault or have any abdominal exercises. During the other months, light

gymnastics are very beneficial. There are several cases on record of women who have taken carefully supervised gymnastics up to within a month or more of confinement, and there is every reason to believe that this treatment has had a direct bearing on the favorable conditions attending the birth of the child and the subsequent rapid recovery.

In cases of amenorrhea due to senile changes, some authorities prescribe internal massage, but it is questionable whether as good results may not be obtained by other means.

Dysmenorrhea is difficult or painful menstruation. There are several varieties, such as congestive, inflammatory, membranous, obstructive, ovarian, spasmodic, etc. The kind is usually diagnosed by the character of the pain. The things to be observed are whether the pain is slight or severe, time of occurrence before, during or after the flow is established. Consider whether the flow aggravates or relieves the pain, also the duration of pain, the site of the pain, whether in back, lower abdomen, etc., also whether the site changes. Then notice the character of the pain, whether it is sharp and cutting, or dull and heavy, steady or radiating whether it is worse if the flow is scanty or the reverse. The treatment depends on careful study of these symptoms.

All forms of dysmenorrhea, except those caused by tumors, parasites or enteritis, may be treated by medical gymnastics. The object of the treatment is to establish a rapid return current in the venous circulation of the pelvis to diminish the occlusion of the capillaries.

In obstructive dysmenorrhea the exudation is normal, but some obstruction causes the flow to collect and coagulate; this coagulum forms a foreign body in the uterus, and whenever there is a foreign body there the uterus sets up a contraction to try to get rid of it. These contractions are painful. Other causes are a narrowing of the os internum, which may be due to a thickening of fibres, or there may be a particularly sensitive area, so that the foreign body causes a spasm, or there may be a polypus or a small fibroid tumor situated near the os internum. The symptoms of the obstructive form of the disease is a sharp pain like cramp after the flow has started, situated in the lower abdomen, occasionally in the lower back. Congestive dysmenorrhea is the most common form. When menstruation is normal, the stimulation starts from the ovaries and is communicated to the uterus. There must be a normal circulation in the uterus and there must be a special change in the mucous membrane of the uterus which admits of a painless discharge. If these conditions are not present there will be

congestive dysmenorrhea. If the stimulation does not begin in the ovaries, there is apt to be ovarian or neuralgic dysmenorrhea, which is caused by over stimulation. The congestion may be active or passive; active when there is an over charge of blood, either because the afflux is too great or the efflux inadequate; passive when there is some obstruction to the passage of venous blood and the organ is overcharged Ovarian or neuralgic dysmenorrhea is probably a neurosis, as pathological changes are present. In this form of disease there is a pain from one to three or more days before the flow. After the flow is established the pain is relieved. The pain may be sharp and neuralgic, radiating up the side and down the legs, and it is accompanied with nausea and headache.

Membranous dysmenorrhea is rather rare. The pain is due to the effort to expel a membrane which is formed and which increases in thickness, or the membrane is not separated easily and a special effort is necessary. Shreds of the membrane may sometimes be seen in the discharge. The general mode of treatment is a rapid T rot, followed by movements to increase thoracic aspiration, as follows:

Step sitt. quick T rot.

Sacral perc.

Supra-pubic press.

Rest Kn. st., quick T rot.

Str. ly. hip circ.

Sacral perc.

Reach gr. ½ Kn. st, Back ext. (single then resistive.)

Ride sitt T. circ.

Pelvis massage (by physician's orders.)

St, back perc. (massage of back useful.)

If the patient is very weak, give general massage. Passive movements can be kept up during the flow. Others may commence a week after the flow. General gymnastics are very valuable, so the patient may have special exercises to practise at home, especially yd. c ride sitt, act. T. rot., str. gr. ly. act. 2 hip circ., other exercises for thoracic aspiration, different forms of pelvic elevations, etc. If dysmenorrhea is due to displacements or foreign growths, this treatment will be not only useless but harmful.

Menstrual { Amenorrhea, absence of
Dysmenorrhea, painful.
Menorrhagia { Excessive.
Metrorrhagia { Excessive.

Mechanical { Displacement.
Flexions.

Diseases of women are caused largely by congestion, due to violence of some kind. There is general atony of tissue, also nervous disturbances, malformations, atrophy, hypertrophy, general debility, capillary occlusion, circulatory disturbances, catarrh of the uterus, etc. Anything tending to increase the return current from the pelvis will stop the trouble. Diseases of this nature may be divided into two classes, viz., disorders of the menses and displacements. Disorders of the menses may depend on general circulatory disturbances, poverty of the blood, general debility, capillary occlusion produced by local congestion.

Catarrh of the uterus is seated in the uterine glands and its connections; it is merely a congestion of the capillaries which relieves itself by exudation of plasma. It is common in scrofulous and anemic individuals and will result from heart, lung or liver diseases. It may be caused by sedentary life, over-exertion, irritability of the

uterine nerves and anything which produces pelvic congestion. Anything tending to increase the return current will stop the trouble. General gymnastics should be frequently intermixed with movements of internal elevation.

Amenorrhea is the name given to that condition where menses do not appear at puberty and remain absent. If this absence is caused by general anemia, impoverishment of the blood, poor circulation, a woman is said to have *chlorosis*. That is the most common form of amenorrhea. As had been said before, amenorrhea may be caused by phthisis, acute disease at puberty, non-development of uterine organs — atrophy, a high degree of obesity, the removal of ovaries or the fallopian tubes. Amenorrhea is usually a symptom, not a primary disease. The purpose of medical gymnastic treatment is to increase the general tonicity of the body, to improve the circulatory functions, and especially the oxygenation of the blood. When local exercises are applied there are well defined effects. Thus, Rest Kn. st., passive quick T. rot. gives massage to the uterus; sacral percussion stimulates the sacral nerves; massage inside the thigh increases the flow in the internal saphenous vein. General massage at the small of the back will relieve the congestion. If amenorrhea is dependent on non-development or atrophy,

then internal massage may be indicated, provided every other means has been tried.

In treating dysmenorrhea it is perfectly safe to give massage during the menstrual period. Sometimes deep kneading along the ovaries from crook, lying position, will prove useful. Also kneading of the fundus with thumb and fingers. Neuralgia is often a symptom. If the neuralgia is in the fallopian tubes or the ovaries, give gentle pressure. Also give kneading of the back and stretch reclining 2 A circumduction. General massage will make the menses more abundant, less painful, more regular. General exercises may be given whose object is to draw the venous current away from the pelvis, thus diminishing the capillary stagnation. Such are resistive T. rot., sacral perc., 2 hip circ., free st. passive T. rot., resp. ex.

Menorrhagia — An excessive menstrual flow — is caused by an obstruction in the circulation of the heart, lungs or liver, or by atony of blood vessels or by inflammation of the floor of the pelvis. Or it may be caused by disturbances of the ovaries and tubes, by tumors, or by disturbances of the uterus itself, as subinvolution, fibroid granulations, etc. Of these causes only a few can be treated by medical gymnastics. The general object of medical gymnastics is to diminish the

arterial pressure in the pelvis. The movements should be stopped at least three days before the period is due and should not commence until three days after the period is well over.

Metrorrhagia is an especially common form of *menorrhagia*. It is a uterine hemorrhage, which is independent of the menstrual period. It may be due to general debility or to incipient phthisis, to heart disease, or to some acute infectious disease. If caused by foreign growths, massage or medical gymnastics are contra-indicated. If due to other causes, try to draw the blood away by giving exercises to increase thoracic aspiration. Give passive movements to tissues around the pelvis and active movements to distal parts.

A typical prescription would be:

Sitt. shoulder circ. (resp.)
Recl. F. circ.
Yd. sitt. A. circ. (sing. or doub.)
Ride sitt. or Rest recl. T. circ.
Recl. hip circ.
Resis. L. ext.
Str. gr. st. or hang. Neck ext.
Str. ly. 2 A. vibr.
Str. ly. resis. 2 A. flex.
Wg. ride sitt. resis. T. rot.

Cr. ly. pelv. elev. 2 Kn. add.

St. Back perc. (ulnar and palmar.)

Displacements. Forward displacements are anteversion and anteflexion; backward displacements are retroversion and retroflexion; downward are prolapsus and procidentia.

There is no fixed position of the uterus, normally, on account of the way it is supported. The position varies with the degree of extension of the bladder and rectum so the uterus is liable to many displacements, but when the patient stands erect the normal position of the uterus is nearly at right angles to a line drawn perpendicularly to the axis of the body. There is a temporary displacement upward and backward due to distention of the bladder, or forward and downward from pressure of the distended rectum. There may be displacement according to the amount of abdominal pressure, depending on whether the patient is sitting or standing, and there may be more or less sagging of the pelvic floor, normally producing a higher or a lower position.

In anteflexion the uterus remains bent forward in the bladder in practically an exaggeration of the normal position. The back ligaments are stretched, the ligaments in front of the bladder are thickened and shortened. This form of displacement may be congenital or it may

be acquired. If congenital, it is due to an imperfectly developed uterus, with small cervix and the external os a pin hole in size, looking forward and downward. If the displacement is acquired, it is usually due to inflammatory changes in front or behind the uterus. The symptoms include dysmenorrhea, both obstructive and congestive, but the pain usually ceases after the flow is established. A common symptom is sterility.

Anteversion is due to the straightening of the uterine axis. It is a tipping over without a bend in the cervix, the cervix looking directly backward and the body directly forward. This is physiological in early pregnancy. It may be caused by anything producing pelvic inflammation, chronic metritis, or sub-involution. The symptoms are not readily perceived. But there are symptoms of the inflammation. There are pressure symptoms, for the uterus pressing on the bladder causes frequent micturition and the pressure of the cervix on the rectum causes painful defecation; there are also reflex disturbances, both nervous and gastric.

Retroversion is the opposite of anteversion. It is a condition in which the uterus is tipped backward without curvature of its axis. It is physiological when the bladder is fully distended, but in the healthy individual the uterus returns to position after the bladder is empty, while in cases needing treatment the uterus remains tilted backward. This is a common congenital affection. It may be acquired by sudden straining, or lifting, or it may appear from some other causes.

Retroflexion is retroversion plus flexion in the cervix; that is, the uterus is bent backward on itself, producing a sharp angle in the axis. Thus, there is a pressure on the whole uterus. It may be congenital or it may be acquired as a result of pregnancy.

In pregnancy with sub-involution of the uterus the cause is either debility or the patient has tried to get up too soon. Sometimes the uterine ligaments are too weak to hold the organ in place, and sometimes some inflammatory process has enlarged the uterus and increased its weight.

The symptoms of retroflexion and retroversion are weakness and pain in the back, symptoms of chronic pelvic peritonitis, as dull aching, painful defecation and constipation, leucorrhœa, dysmenorrhœa, menorrhagia and sterility.

Prolapsus. The pelvic floor consists of a thick, fleshy, elastic layer, composed of muscles, cellular tissue, blood vessels and nerves, bound together by connective tissue. There is nothing to give this mass stability, but the uterus and the ovaries, with their tubes, all rest on this floor.

By *prolapsus* is meant the falling forward or downward of the whole pelvic floor. The uterus may be the most affected, but as it rests on the floor it cannot prolapse without the floor going with it. There are different degrees of prolapsus. The uterus may sag slightly or it may protrude so that the cervix almost completely fills up the vagina. It sometimes pushes the cervix completely outside the vagina. The greatest degree is called *procidentia* when the whole uterus protrudes. This condition may not exist all the time, but occurs at the slightest effort.

Cystocele is a hernia of the anterior wall of the vagina and the posterior wall of the bladder.

Rectocele is a prolapse of the posterior wall of the rectum into the vagina. A prolapsus may occur through a deficient support of the pelvic floor, or through deficient tone of the pelvic floor with a slackening of the loose tissue around it, or through ultra-abdominal pressure, this being the most important cause and the most common. Intra-abdominal pressure may be caused by incorrect car-

riage of the body, by tight lacing, by sudden falls, or by abdominal tumors.

The symptoms of prolapsus are discomfort from protrusion and excoriation of parts, a falling feeling or a dragging feeling. Usually there is difficult micturition.

In all cases of displacement the abdominal nutrition diminishes and the blood becomes stagnant, the chest capacity diminishes and presses on the pelvis. In mild cases of retroversion, anteversion and prolapsus try to strengthen and improve the nutrition of the parts. Give internal elevation with forcible pressure on the viscera in a direction opposite to that in which they have descended. Give also movements of pelvic elevation. Use a large number of respiratory exercises with careful choice of commencing positions. In anteversion by medical gymnastics try to tip the uterus backward aud lift it. In retroversion, by the same means, try to tip the uterus forward and lift it. Some special exercises for retroversion are :

Kn. chest. pos. (for five or six minutes.)

Prone ly. pelv. elev.

Stoop-fall or Hor. stoop-fall pos.

For anteversion, have patient sit on the couch, with feet up the inclined plane (have the angle at first slight, then gradually increase as much as needed.) Give gentle

friction from the pelvic arch to the chest. Then give Cr. *a* ly. pelv. elev. with Kn. abd. and add., and Str. ly. 2 L. elev.

In respiratory exercises for women the commencing position has much to do with the effect. If the patient stands or sits, at inhalation, the diaphragm flattens, the chest wall rises and the abdomen expands. Then the intestines fall forward in women, because there is less resistance than below. At the same time gravity and the action of the diaphragm press the intestines down on the pelvic organs, unless there is absolutely correct carriage. In cases of displacement, respiratory exercises, if given in standing position, are bad. They should be given in the lying position, except in retroversion, when stoop sitt. is used as a commencing position, both for respiratory and other exercises. In prolapsus, use any of the movements just described. Give back percussion and sacral percussion to stimulate the sacral plexus. Give exercises of internal elevation. Kn. add. will increase the strength of the pelvic floor. Bear in mind that exercises which remove congestion are to be given, also exercises that develop the external muscles. The nutritive activity of the entire region must be increased, also the tonicity of the uterine ligaments. Any exercise is good which expands the chest and produces thoracic aspiration. Sample ex-

ercises are 2 A circ., Res. 2 A flex., Resp. Ex., Res. T. rot. Make a proper use of gravity and pressure to force the organ back into correct position.

There are no specific movements for cases of flexion. Use movements of internal elevation.

The question has been asked if it is safe to give exercises to remove pelvic congestion if there is uterine ulceration. This question is best left to the decision of the physician. Great care should be taken in any case.

Displacement of Ovaries. The ovaries are held together by ligament formed by two layers of peritoneum, (the ovary is practically covered only on one side not well supported) ovarian ligament, ovarian fimbræ, infundibulo pelvic ligament, edge of broad ligament which supports the ovary. Its own weight will affect the position of the ovary; if congested (as in menstruation), it will fall more or less and return after the congestion disappears. It may also be displaced by a distended bladder, pregnancy, etc. From lack of tone or from pathological displacements there may be adhesions which bind the ovary down. It may be prolapsed retro-laterally, it may come down in front of the uterus, it is very common in Douglas' cul-de-sac. The symptoms are radiating pains, pains at defecation, a dragging sensation, nervous symptoms and general irritability. The treatment should include anything that

increases the tone of the muscles of the pelvis walls, massage of the abdomen and uterine region. Kn. chest pos. Stoop fall pos. hor. and incl. If the ovary is displaced laterally or anteriorly, give Ly. L. elev. and internal massage.

The Fallopian tubes may be displaced, prolapsed with other tissues. We find them quite often prolapsed into Douglas' cul-de-sac. Treat as any prolapsus. Internal massage is sometimes given.

Ovaritis, or inflammation of the ovaries, may be acute or chronic, the acute being the rarer form. It may be produced by taking cold during the menstrual period, by gonorrhea, childbirth, abortion, or pelvic peritonitis. It is characterized by pain anteriorly or at the side, usually radiating in the back. There is pain or pressure in the iliac region. Acute ovaritis should be let alone. Chronic may be helped by pelvic massage.

Metritis is inflammation of the uterus. It is usually chronic, in one of two stages. In the first stage the uterus is engorged with blood and becomes larger and heavier, less firm and elastic. In the second stage the cells have proliferated and more connective tissue is formed. This tissue shrinks and the organ becomes smaller, harder and less vascular. If the organ continues to contract, it becomes as dense and hard as a billiard ball.

The affection is caused by anything which produces long-continued interference with the circulation, such as numerous pregnancies and returning too soon to active life. Aggravated displacements may also be a cause. It is found among women who run sewing machines, or those who stand or sit a large part of the time, as dress-makers, shop girls or bookkeepers. The symptoms are pain in the back, bearing down in the pelvis, dysmenorrhea, at first menorrhagia and then amenorrhea, frequent and painful micturition. Metritis cannot be treated by massage, but educational gymnastics may be given to improve the circulation and to draw the blood to distal parts.

Endometritis is inflammation of the mucous lining of the uterus. *Endocervicitis* is inflammation of the lining of the cervix. You may have endocervicitis without endometritis, but you never have the latter without the former. The affection is caused by exposure to cold during menstruation, by puerperium, polypus, or displacement. It is characterized by menorrhagia, leucorrhea, dysmenorrhea, weakness in the back, pain in the pelvic region. There may be reflex digestive disturbances. Try to relieve the general conditions.

Leucorrhea (or leukorrhea) is normal in one person and abnormal in another. The name is applied to a dis-

charge, rather than to the condition that causes it. The amount of the discharge varies. It is always present before and after menstruation. There is always some discharge from the vagina, but an unusual increase is pathological. If the discharge is abundant and white it comes from the cervix. If it is prurulent, greenish and thick it comes from the fundus. For the cases that require treatment give a five minute cold sitzbath at bedtime, then rub with alcohol or a rough towel. Improve the general health by general massage.

Note.—A table for use in cases of menorragia is as follows :

1. St. Back perc.
   Sitt. Shoulder circ.
2. Str. sitt. 2 A. circ.
   " " " " flex.
3. Str. ly. 2 Hip. circ.
   Rest std. st. sidew. flex. (single)
4. Rest sitt. res. T rot.
   Reach ly. 2 A. elev.
5. Recl. res. L. ext.
   St. Back perc.
   Res. H. backw. flex.

Indications and Contra-Indications for Massage.

Indications. — When it is desirable to stimulate the normal physiological processes in the body and to produce a lively exchange of matter; to drive away hyperæmia and inflammation; to reabsorb pathological products which may again be circulated without injury to the system.

Contra-indications. — In all infectious diseases; in new growths and most skin diseases; in diseases where the inflammatory products have assumed a quality injurious to the system or where the pathological anatomy of the diseased part puts an insurmountable hindrance to a favorable result.

Rules for Writing Prescriptions.

There are certain rules to be followed in applying medical gymnastics. These are not arbitrary, but may be somewhat varied to suit different patients; as a general thing, however, they embody the experience of the best masseurs.

The number of movements applied in each sitting varies from two to twelve according to the nature and degree of the disease; their force, frequency, and duration depend on the local and general health of the patient and on the time of reaction of the movement. Procedures are arranged into prescriptions, one of these usually being applied from one to three weeks at a time. Prescriptions should be reduced to the minimum as to number of movements and have a

maximum of effect. They should contain both local and general applications according to the following rules.

1. Gentle movements should begin and end the prescription, stronger ones being applied in the middle.

2. The effect of one movement should improve that of the one preceding or prepare the way for the following movement, or, at least should not lessen the effect in any way.

3. If one specific movement is applied it should occur in the middle or near the end of the prescription.

4. If two or more specific procedures are used they should be evenly distributed over the sitting, yet without being the first or last ones applied.

5. Prescriptions should be arranged with a view to giving them the maximum of force applicable to the case in question.

6. Treatment should at first have an alterative or derivative character with the specific movements brought in only gradually.

7. Change of prescriptions should wherever possible be made with increase of force so that passive movements are gradually substituted by assistive ones and these by single and resistive ones, until finally the prescription takes the form of a table of exercises as used in hygienic or educational gymnastics.

8. Movements are grouped by twos or threes with a short pause after every group during which the movements are assimilated.

(This pause is not identical with complete passivity).

9. The operator should decide the quantity and quality of each movement and should not allow a patient to take more or less of a movement according to more or less agreeable effect temporarily produced.

10. Prescriptions should not be so long as to require more than one hour for application. If reduced to its minimum it usually occupies from fifteen to forty-five minutes.

11. Movements in prescriptions are written in abbreviations according to some nomenclature understood by the operator.

12. Prescriptions should be dated; the patient's name, age, disease, etc., stated; also how often and for how long the prescription is to be used, and other directions needed by the operator.